

AD-A125 154

CHESAPEAKE BAY LOW FRESHWATER INFLOW STUDY PHASE II

1/3

BIOA ASSESSMENT MAP..(U) WESTERN ECO-SYSTEMS

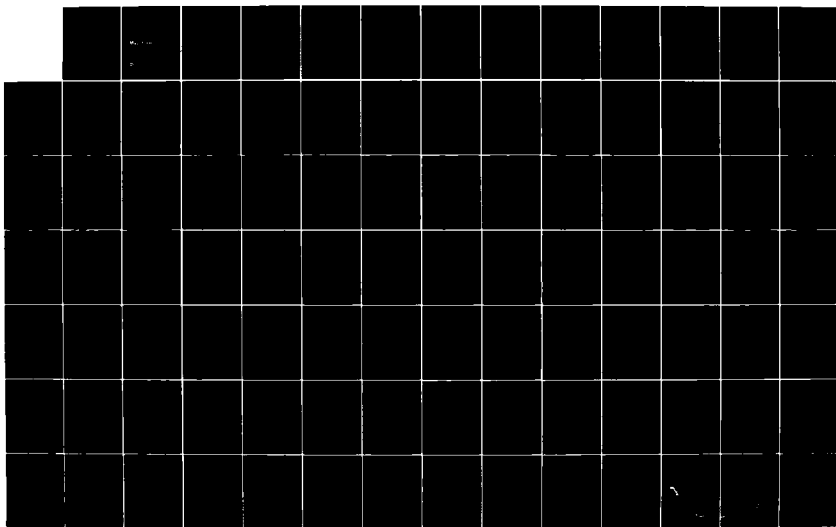
TECHNOLOGY INC BOTHELL WA G B MACKIERMAN ET AL. MAY 82

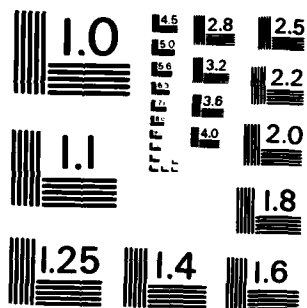
UNCLASSIFIED

DACW31-79-C-0056

F/O 6/8

NL





MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS - 1963 - A

May 1982

**Chesapeake Bay Low Freshwater Inflow Study  
Phase II Biota Assessment**

**Map Folio**

AD A1200150



**US Army Corps  
of Engineers**  
Baltimore District

**DTIC FILE COPY**

**by Western Eco-Systems Techn**

100

# r Inflow Study

DTIC  
S E L F  
MAR 3 1983  
A

Prepared for U.S. Army Engineer District Baltimore  
by Western Eco-Systems Technology, Inc. 204 215th St., S.E. Bothell, Washington 98011

This document has been approved  
for public release and sale; its  
distribution is unlimited.

83-03-03-0072



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A135 154	
4. TITLE (and Subtitle) CHESAPEAKE BAY LOW FRESHWATER INFLOW STUDY BIOTA ASSESSMENT PHASE II: FINAL REPORT MAP FOLIO		5. TYPE OF REPORT & PERIOD COVERED FINAL
7. AUTHOR(s) Report: Gail B. Mackiernan, David F. Bleil, G. Bradford Shea Map Folio: Joellyn Shea, Judith McFarland		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Western Eco-Systems Technology, Inc. 204 215th St. S.E. Bothell, Washington 98011		8. CONTRACT OR GRANT NUMBER(s) DACW31-79-C-0056
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District Baltimore P.O. Box 1715 Baltimore, MD 21203		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE MAY 1982
		13. NUMBER OF PAGES 105 Plates
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Chesapeake Bay, Biology, Salinity, Habitat, Estuary		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) -An assessment of the effects of low freshwater inflow conditions on the biota of Chesapeake Bay was conducted through use of data output from the U.S. Army Corps of Engineers' Chesapeake Bay Hydraulic Model. Four sets of test conditions (scenarios) were used which simulated effects of drought and effects of future consumptive water withdrawal and use as deviations from present average flow conditions. Changes in habitat of over 50 biological organisms were predicted and mapped based on salinity and other variables. Changes in habitat,		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 69 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

which were used to determine  
to include increases  
tolerances, and inter-  
change was found to

## UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	3. RECIPIENT'S CATALOG NUMBER
154	
2. TYPE OF REPORT & PERIOD COVERED	
FINAL	
4. PERFORMING ORG. REPORT NUMBER	
5. CONTRACT OR GRANT NUMBER(s)	
DACW31-79-C-0056	
6. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
7. REPORT DATE	
MAY 1982	
8. NUMBER OF PAGES	
105 Plates	
9. SECURITY CLASS. (of this report)	
UNCLASSIFIED	
10. DECLASSIFICATION DOWNGRADING SCHEDULE	

limited.

(Different from Report)

(Block number)

Estuary

(Block number)

ter inflow conditions on the biota of data output from the U.S. Army Model. Four sets of test connected effects of drought and effects of as deviations from present average or 50 biological organisms were pre-er variables. Changes in habitat,

which were used to delineate the amount of impact from low flow, were found to include increases and decreases depending on the species, its lifecycle, tolerances, and interactions with other organisms. The magnitude of habitat change was found to generally increase as salinity changes increased.



DTIC	
COPY REQUESTED	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	
42	
43	
44	
45	
46	
47	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	
70	
71	
72	
73	
74	
75	
76	
77	
78	
79	
80	
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	
91	
92	
93	
94	
95	
96	
97	
98	
99	
100	

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

## INTRODUCTION

This folio is a principal product of the Biota Assessment portion of the Corps of Engineers' Chesapeake Bay Low Freshwater Inflow Study. The purpose of the mapping is to portray habitat for selected Chesapeake Bay species under a variety of freshwater inflow conditions. They are based on the results of tests done on the Chesapeake Bay Hydraulic Model simulating four freshwater inflow conditions. These were:

- 1) Base Average -- average freshwater inflow conditions.
- 2) Future Average -- reflective of average inflow conditions reduced by increased water consumption projected for the year 2020.
- 3) Base Drought -- simulating an actual drought in the 1960's.
- 4) Future Drought -- simulated 1960's drought inflows, reduced by increased water consumption projected for the year 2020.

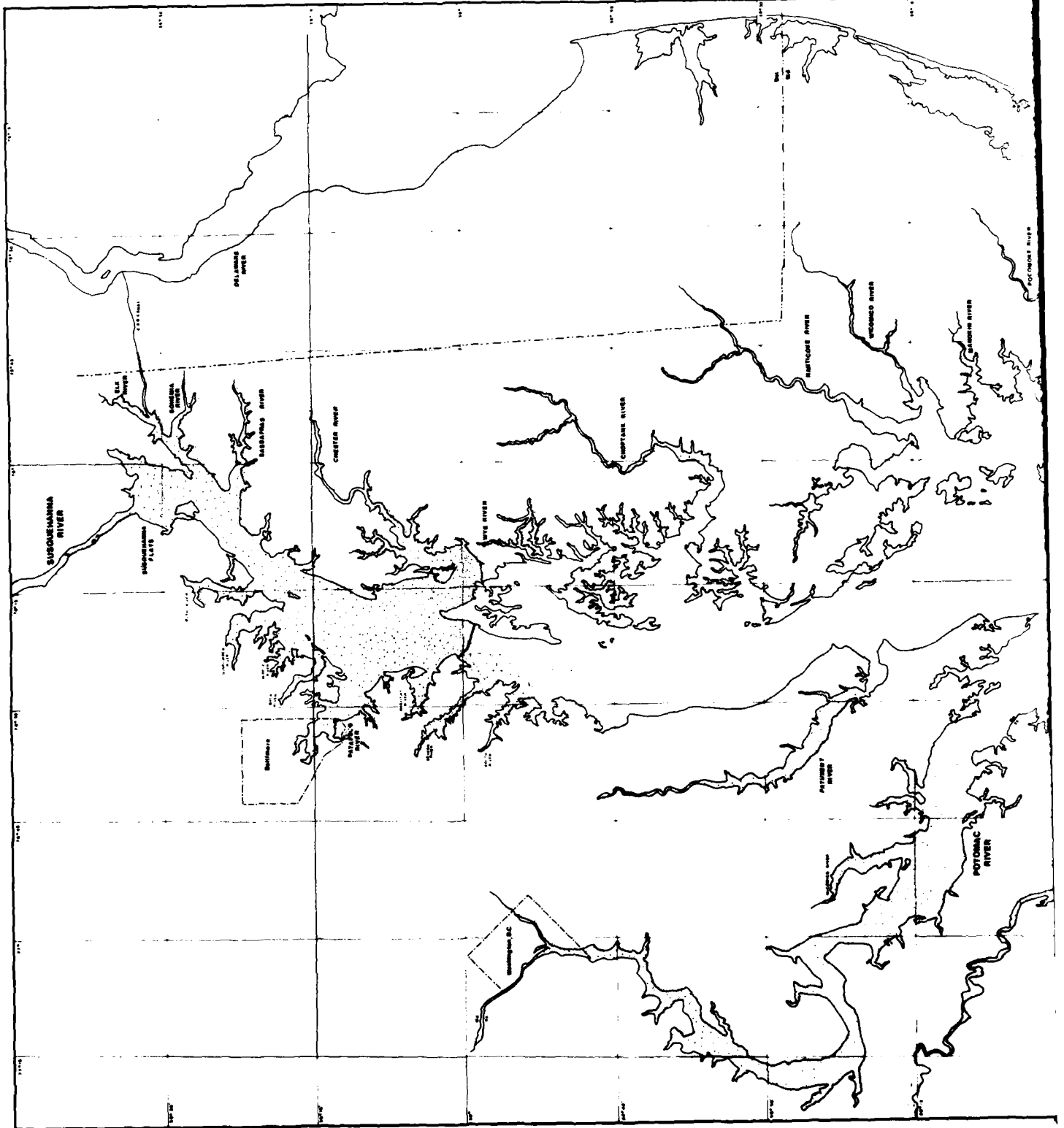
Data from the hydraulic model tests were subsequently used to generate seasonal average salinities at various depths from the mouth of the Bay to the head of tide in each tributary. These salinity data, in conjunction with data on depth, substrate, and dependence on other organisms, was used to create the maps of habitat portrayed in this volume. For further discussion of the information presented herein, the reader is referenced to the Chesapeake Bay Low Freshwater Inflow Study Biota Assessment, Phase II; Final Report, May 1982.

# TABLE OF CONTENTS

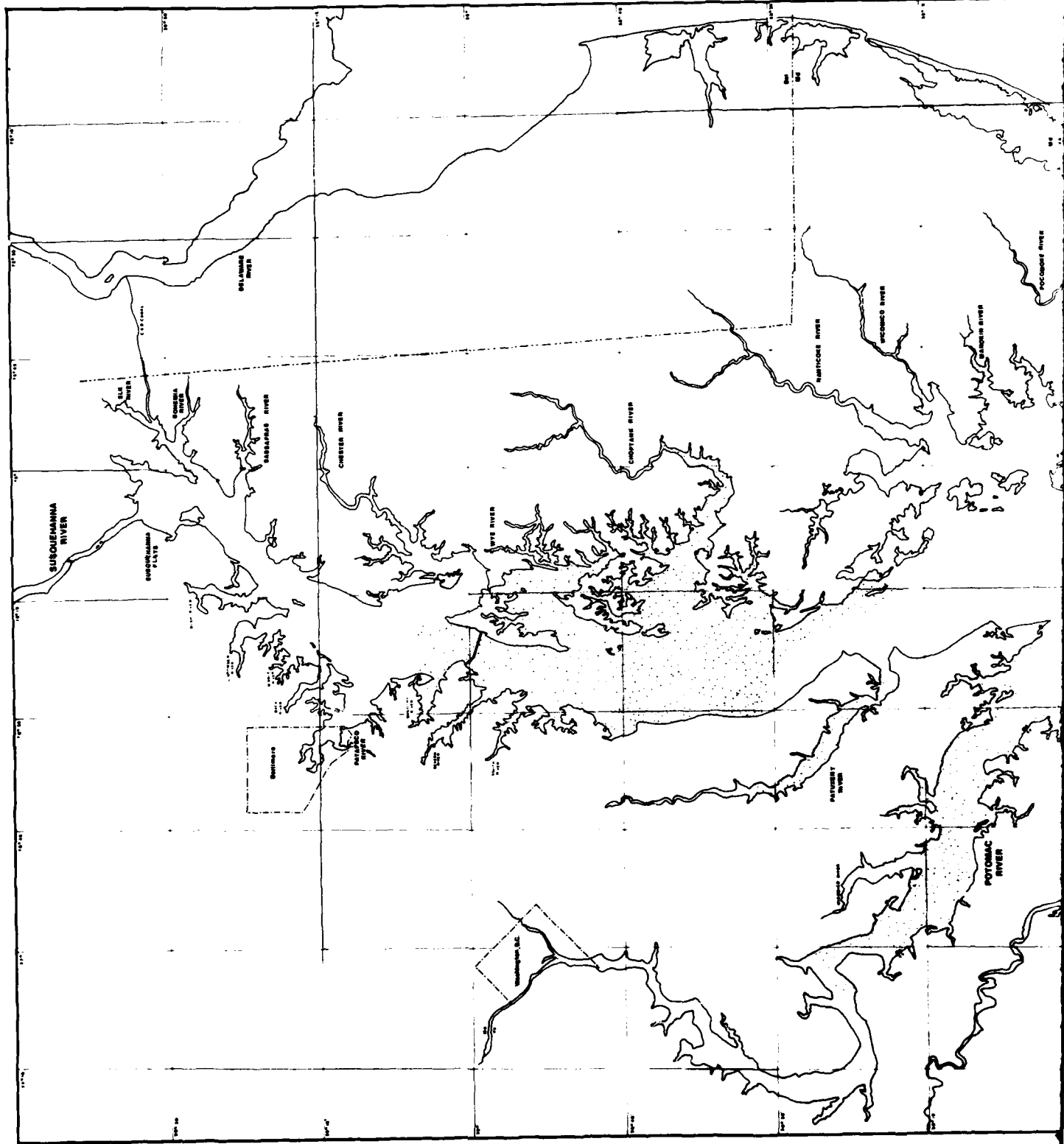
<u>TITLE</u>	<u>Plate No.</u>	<u>TITLE</u>
Base Average		
Tidal Fresh Phytoplankton, Winter/Spring	1	Anchoa mitchilli
Oligo-Low Mesohaline Phytoplankton, Winter/Spring	2	Leiostomus xanthurus
Mesohaline Phytoplankton, Winter/Spring	3	Morone saxatilis
Polyhaline Phytoplankton, Summer/Fall	4	Aythya valisineria
Tidal Fresh Phytoplankton, Summer/Fall	5	
Oligo-Low Mesohaline Phytoplankton, Summer/Fall	6	Future Average
Mesohaline Phytoplankton, Summer/Fall	7	Potamogeton pectinatus
Prorocentrum minimum (Dinoflagellate)	8	Potamogeton perfoliatus
Ceratophyllum demersum (Coontail)	9	Chrysaora quinquecirrha
Ruppia maritima (Widgeon Grass)	10	Eurytemora affinis
Zostera marina (Eelgrass)	11	Urosalpinx cinerea
Zannichellia palustris (Horned Pondweed)	12	Crassostrea virginica
Emergent Aquatic Vegetation (Coastal Fresh Marsh)	13	Macoma balthica
Mnemiopsis leidyi Summer (Ctenophore - Sea Walnut)	14	Mercenaria mercenaria
Mnemiopsis leidyi Winter (Ctenophore - Sea Walnut)	15	Mya arenaria
Brachionis calyciflorus (Rotifer)	16	Callinectes sapidus
Acartia clausi (Copepod)	17	Callinectes sapidus
Acartia tonsa (Copepod)	18	Alosa sapidissima
Scottolana canadensis (Copepod)	19	Brevoortia tyrannus
Bosmina longirostris (Cladoceran)	20	Anchoa mitchilli
Evadne tergestina (Cladoceran)	21	Leiostomus xanthurus
Podon polyphemoides (Cladoceran)	22	Morone saxatilis
Limnodrilus hoffmeisteri (Oligochaete Worm)	23	Aythya valisineria
Heteromastus filiformis (Polychaete Worm)	24	
Pectinaria gouldii (Polychaete Worm)	25	Base Drought (Major 15 Species)
Scolecopides viridis (Polychaete Worm)	26	Potamogeton pectinatus
Streblospio benedicti (Polychaete Worm)	27	Potamogeton perfoliatus
Mulinia lateralis (Coot Clam)	28	Chrysaora quinquecirrha
Rangia cuneata (Brackish Water Clam)	29	Eurytemora affinis
Ampelisca abdita (Amphipod)	30	Urosalpinx cinerea
Balanus improvisus (Acorn Barnacle)	31	Crassostrea virginica
Cyathura polita (Isopod)	32	Macoma balthica
Gammarus daiberi (Amphipod)	33	Mercenaria mercenaria
Leptocheirus plumulosus (Amphipod)	34	Mya arenaria
Palaemonetes pugio (Grass Shrimp)	35	Callinectes sapidus
Alosa pseudoharengus (Alewife - Eggs & Larvae)	36	Callinectes sapidus
Alosa pseudoharengus (Alewife - Juveniles)	37	Alosa sapidissima
Micropogonias undulatus (Atlantic Croaker)	38	Brevoortia tyrannus
Menidia menidia (Atlantic Silverside)	39	Anchoa mitchilli
Morone americana (White Perch)	40	Leiostomus xanthurus
Perca flavescens (Yellow Perch)	41	Morone saxatilis
		Aythya valisineria
Base Average (Major 15 Species)		
Potamogeton pectinatus (Sago Pondweed)	42	Future Drought
Potamogeton perfoliatus (Redhead Grass)	42	Potamogeton pectinatus
Chrysaora quinquecirrha (Sea Nettle)	43	Potamogeton perfoliatus
Eurytemora affinis (Copepod)	44	Chrysaora quinquecirrha
Urosalpinx cinerea (Oyster Drill)	45	Eurytemora affinis
Crassostrea virginica (American Oyster)	46	Urosalpinx cinerea
Macoma balthica (Baltic Macoma)	47	Crassostrea virginica
Mercenaria mercenaria (Hard Clam)	48	Macoma balthica
Mya arenaria (Soft Clam)	49	Mercenaria mercenaria
Callinectes sapidus (Blue Crab - Summer males)	50	Mya arenaria
Callinectes sapidus (Blue Crab - Summer females)	51	Callinectes sapidus
Alosa sapidissima (American Shad)	52	Callinectes sapidus
Brevoortia tyrannus (Menhaden)	53	Alosa sapidissima

TABLE OF CONTENTS (Cont'd)

<u>ate No.</u>	<u>TITLE</u>	<u>Plate No.</u>
1	<u>Anchoa mitchilli</u> (Bay Anchovy)	54
2	<u>Leiostomus xanthurus</u> (Spot)	55
3	<u>Morone saxatilis</u> (Striped Bass)	56
4	<u>Aythya valisineria</u> (Canvasback Duck)	57
5		
6	Future Average (Major 15 Species)	
7	<u>Potamogeton pectinatus</u> (Sago Pondweed)	58
8	<u>Potamogeton perfoliatus</u> (Redhead Grass)	58
9	<u>Chrysaora quinquecirrha</u> (Sea Nettle)	59
10	<u>Eurytemora affinis</u> (Copepod)	60
11	<u>Urosalpinx cinerea</u> (Oyster Drill)	61
12	<u>Crassostrea virginica</u> (American Oyster)	62
13	<u>Macoma balthica</u> (Baltic Macoma)	63
14	<u>Mercenaria mercenaria</u> (Hard Clam, Quahog)	64
15	<u>Mya arenaria</u> (Soft-Shell Clam)	65
16	<u>Callinectes sapidus</u> (Blue Crab - summer males)	66
17	<u>Callinectes sapidus</u> (Blue Crab - summer females)	67
18	<u>Alosa sapidissima</u> (American Shad)	68
19	<u>Brevoortia tyrannus</u> (Menhaden)	69
20	<u>Anchoa mitchilli</u> (Bay Anchovy)	70
21	<u>Leiostomus xanthurus</u> (Spot)	71
22	<u>Morone saxatilis</u> (Striped Bass)	72
23	<u>Aythya valisineria</u> (Canvasback Duck)	73
24		
25	Base Drought (Major 15 Species)	
26	<u>Potamogeton pectinatus</u> (Sago Pondweed)	74
27	<u>Potamogeton perfoliatus</u> (Redhead Grass)	74
28	<u>Chrysaora quinquecirrha</u> (Sea Nettle)	75
29	<u>Eurytemora affinis</u> (Copepod)	76
30	<u>Urosalpinx cinerea</u> (Oyster Drill)	77
31	<u>Crassostrea virginica</u> (American Oyster)	78
32	<u>Macoma balthica</u> (Baltic Macoma)	79
33	<u>Mercenaria mercenaria</u> (Hard Clam, Quahog)	80
34	<u>Mya arenaria</u> (Soft-Shell Clam)	81
35	<u>Callinectes sapidus</u> (Blue Crab - summer males)	82
36	<u>Callinectes sapidus</u> (Blue Crab - summer females)	83
37	<u>Alosa sapidissima</u> (American Shad)	84
38	<u>Brevoortia tyrannus</u> (Menhaden)	85
39	<u>Anchoa mitchilli</u> (Bay Anchovy)	86
40	<u>Leiostomus xanthurus</u> (Spot)	87
41	<u>Morone saxatilis</u> (Striped Bass)	88
	<u>Aythya valisineria</u> (Canvasback Duck)	89
42		
42	Future Drought (Major 15 Species)	
43	<u>Potamogeton pectinatus</u> (Sago Pondweed)	90
44	<u>Potamogeton perfoliatus</u> (Redhead Grass)	90
45	<u>Chrysaora quinquecirrha</u> (Sea Nettle)	91
46	<u>Eurytemora affinis</u> (Copepod)	92
47	<u>Urosalpinx cinerea</u> (Oyster Drill)	93
48	<u>Crassostrea virginica</u> (American Oyster)	94
49	<u>Macoma balthica</u> (Baltic Macoma)	95
50	<u>Mercenaria mercenaria</u> (Hard Clam, Quahog)	96
51	<u>Mya arenaria</u> (Soft-Shell Clam)	97
52	<u>Callinectes sapidus</u> (Blue Crab - summer males)	98
53	<u>Callinectes sapidus</u> (Blue Crab - summer females)	99
	<u>Alosa sapidissima</u> (American Shad)	100

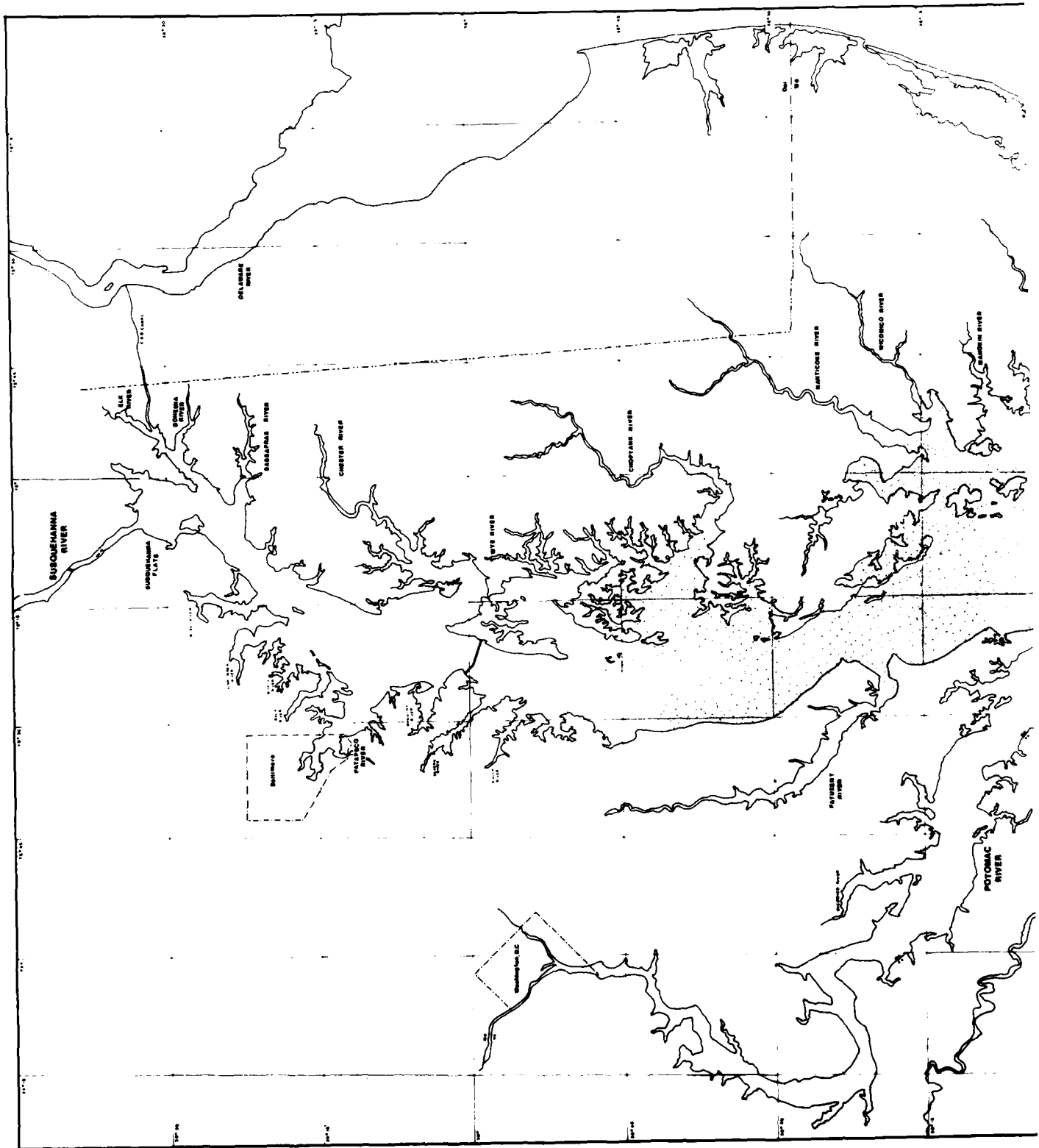


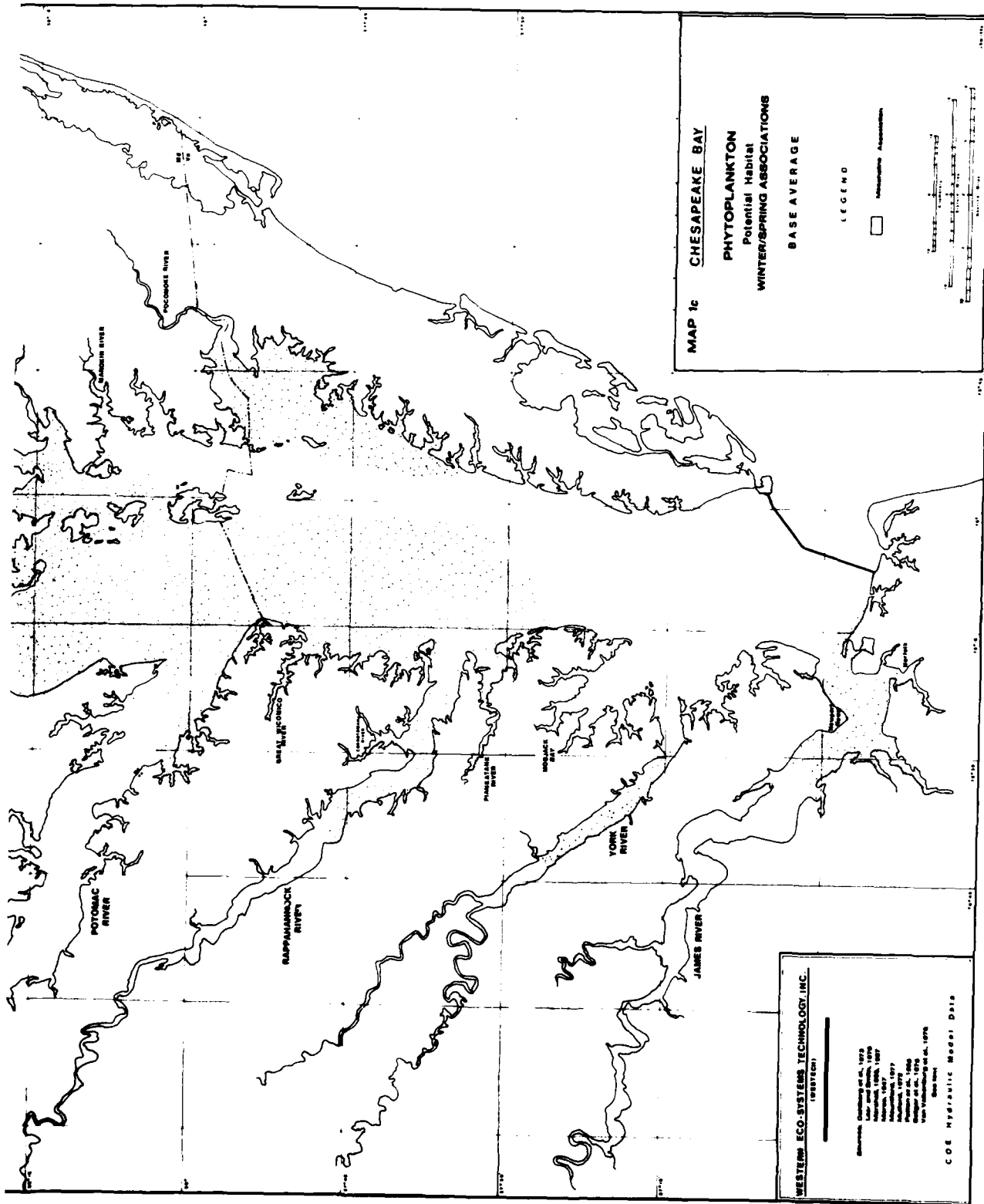


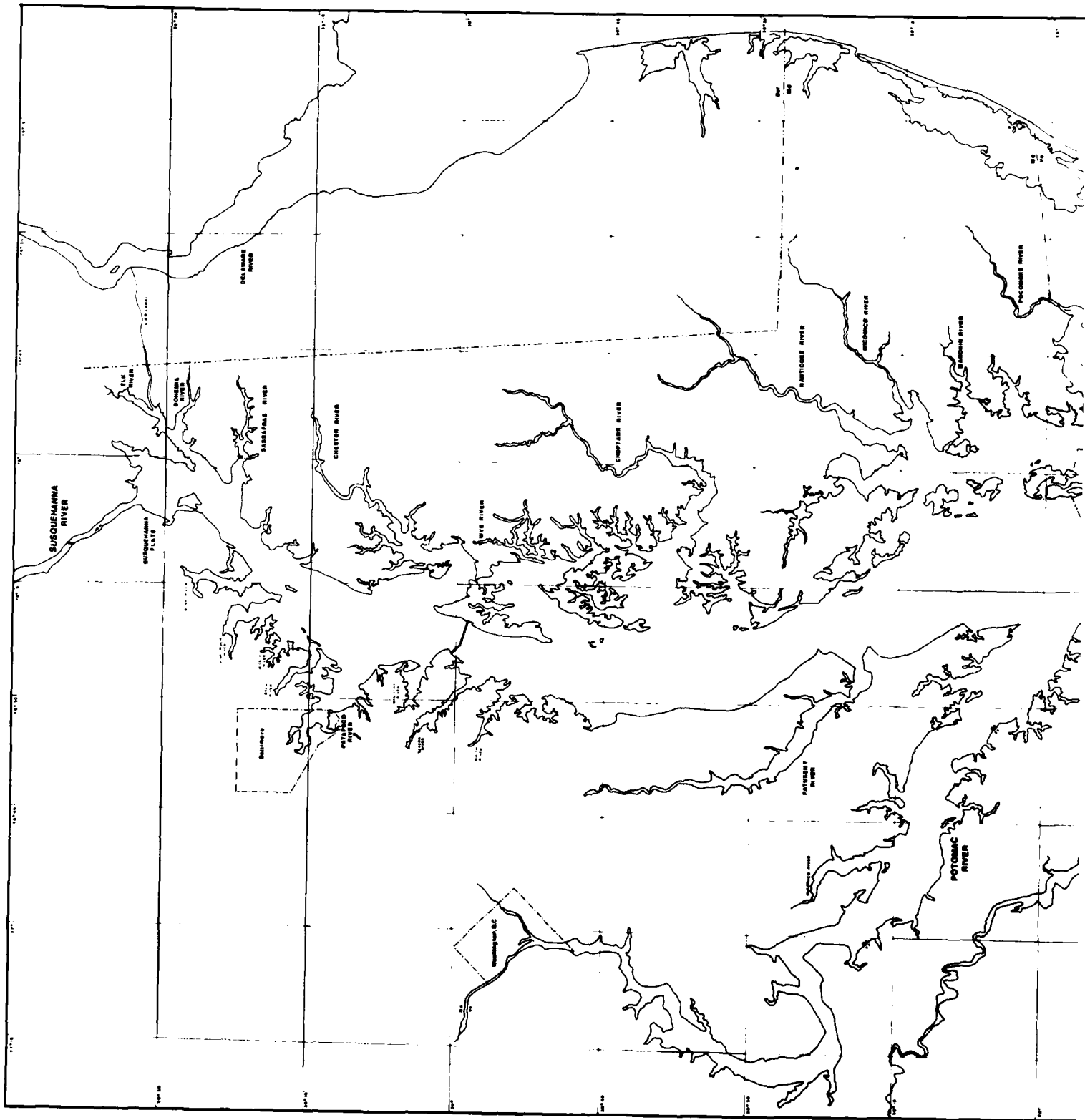


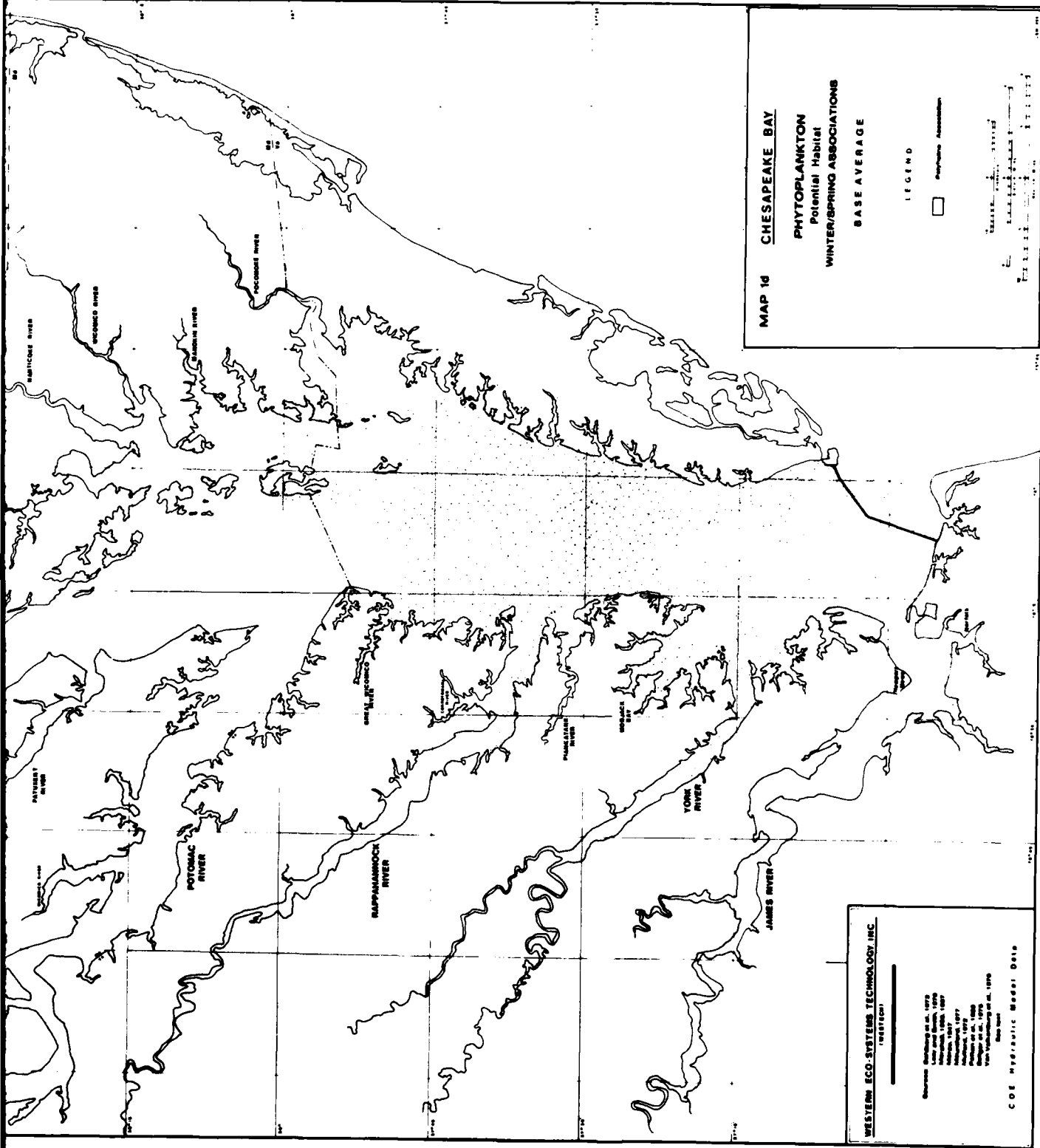


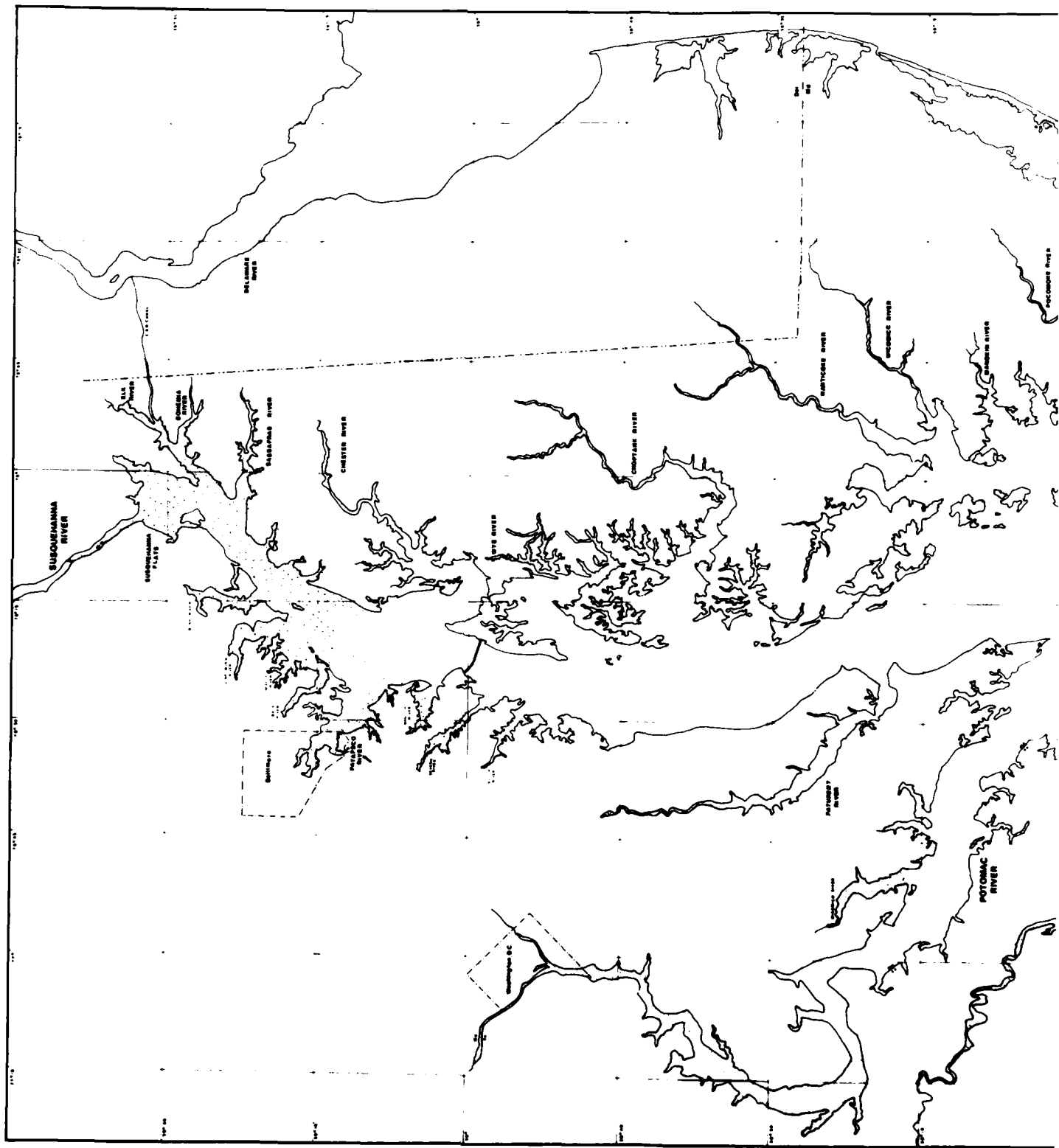


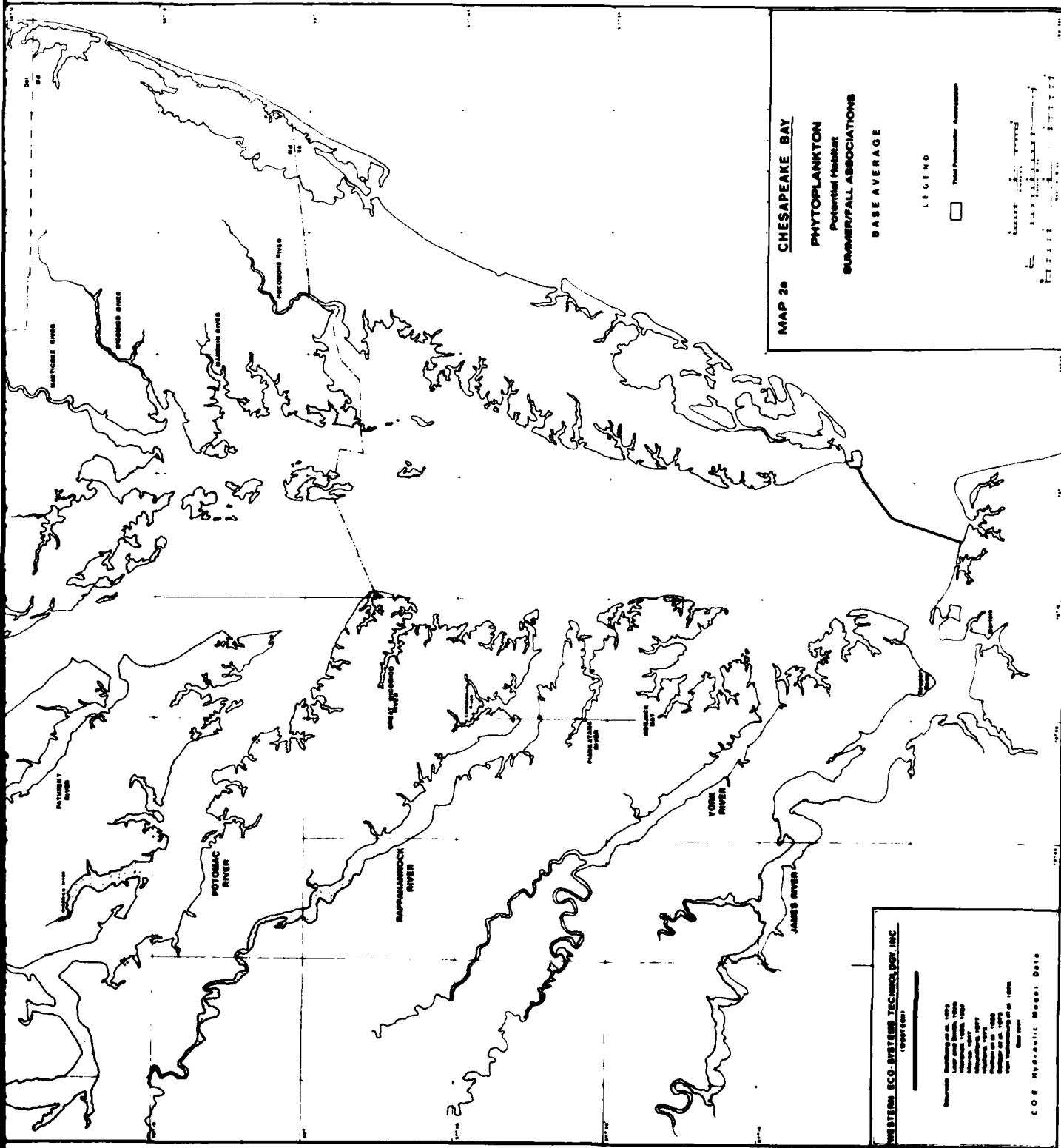


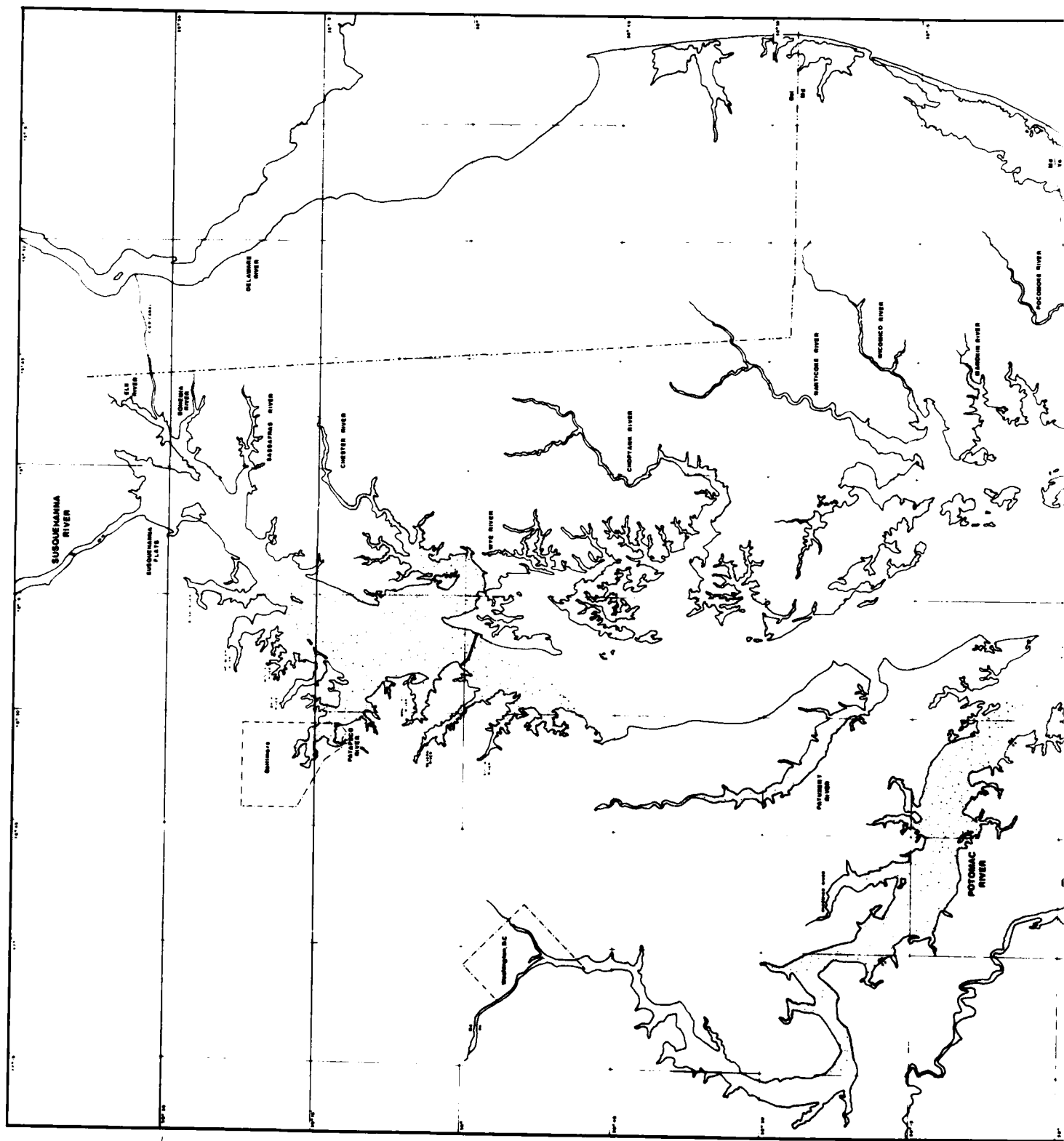




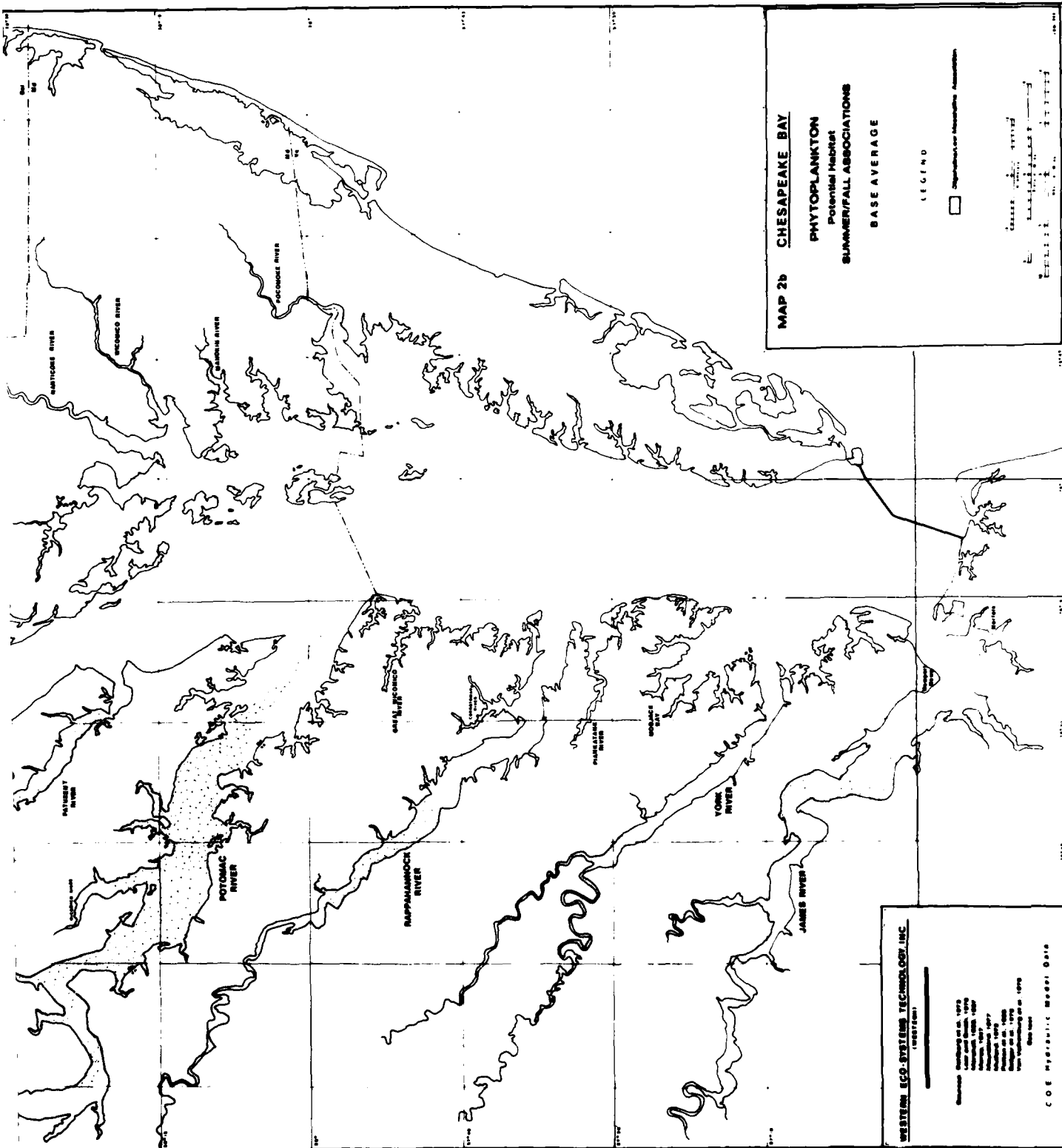


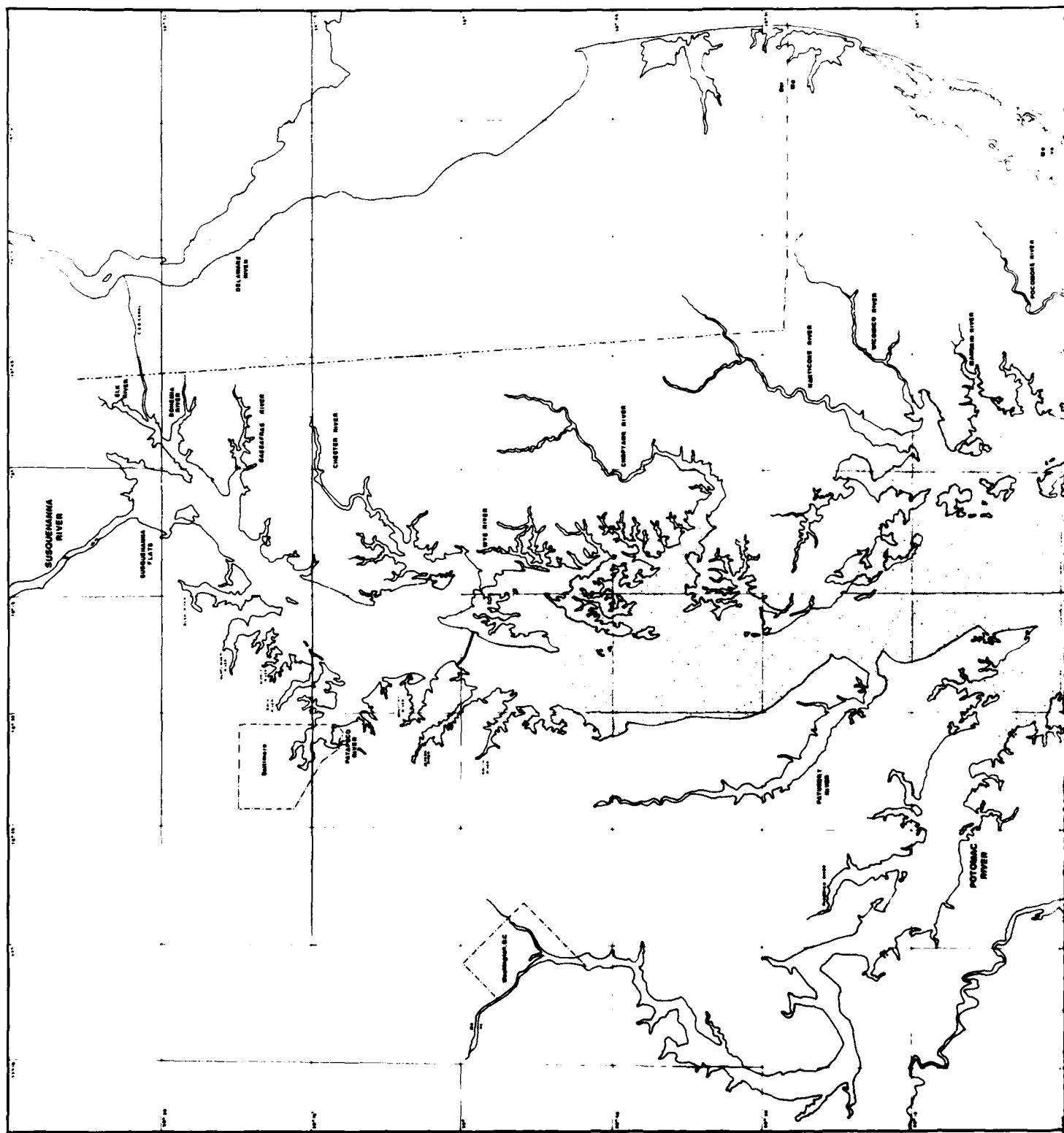


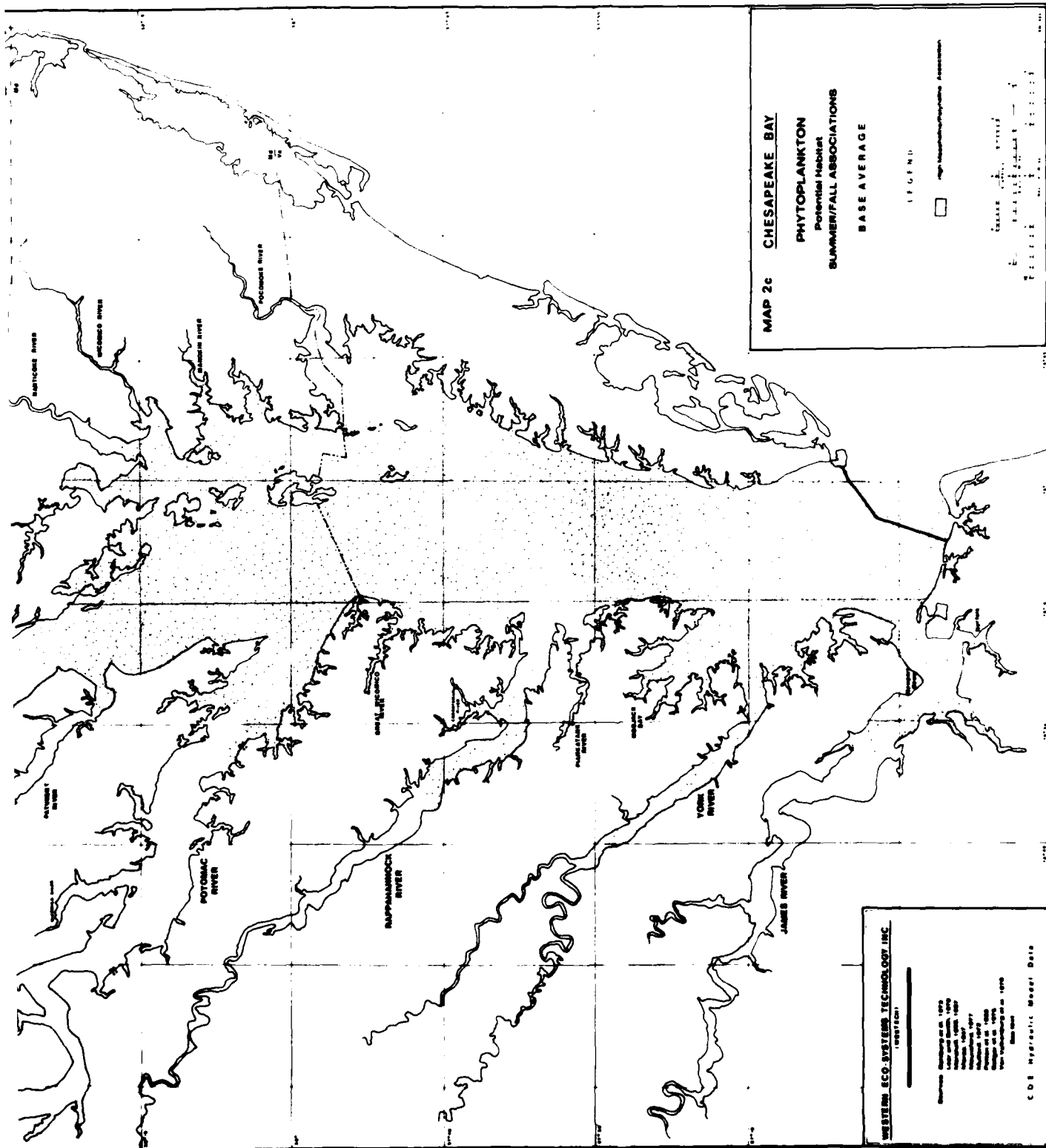


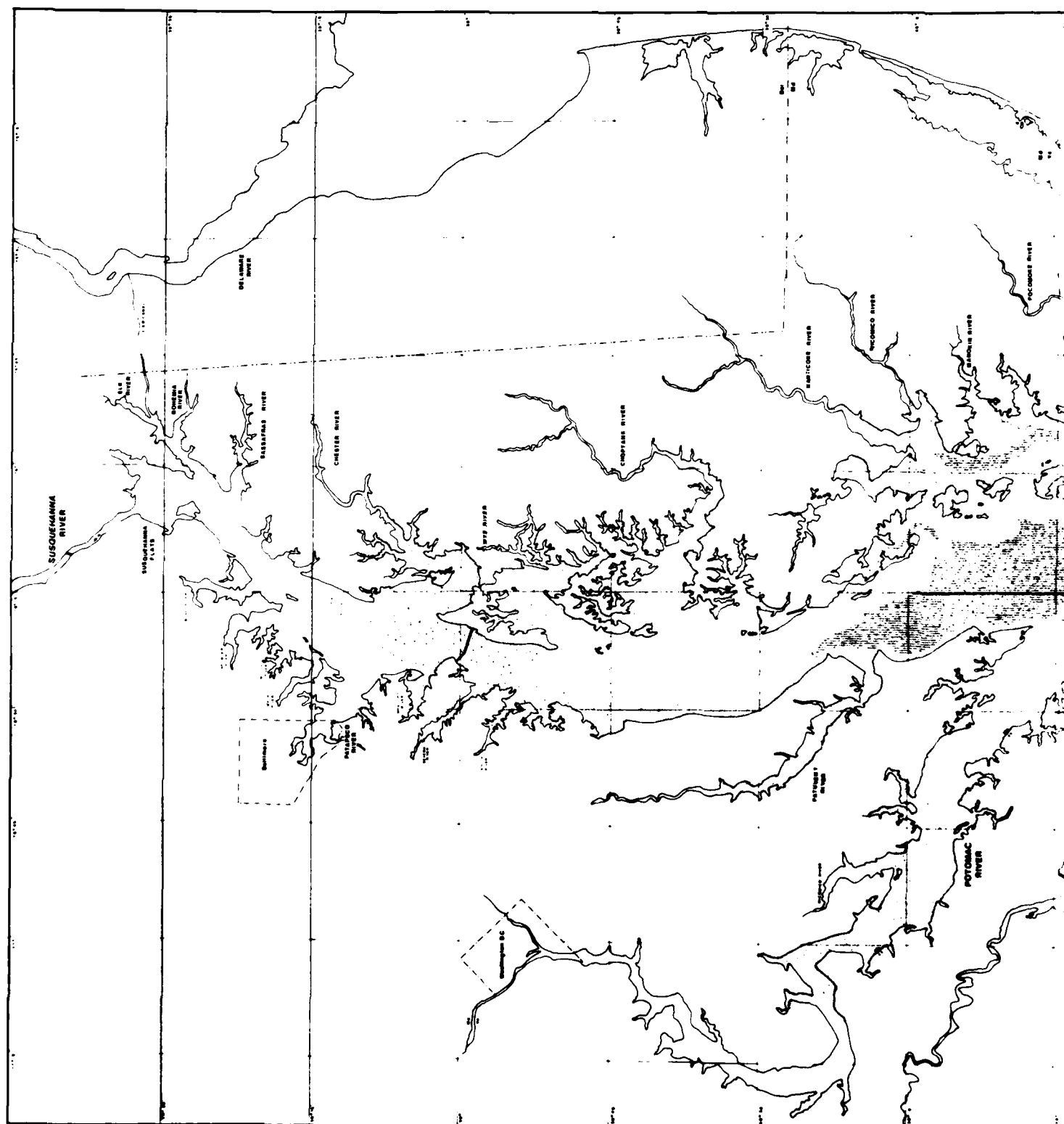




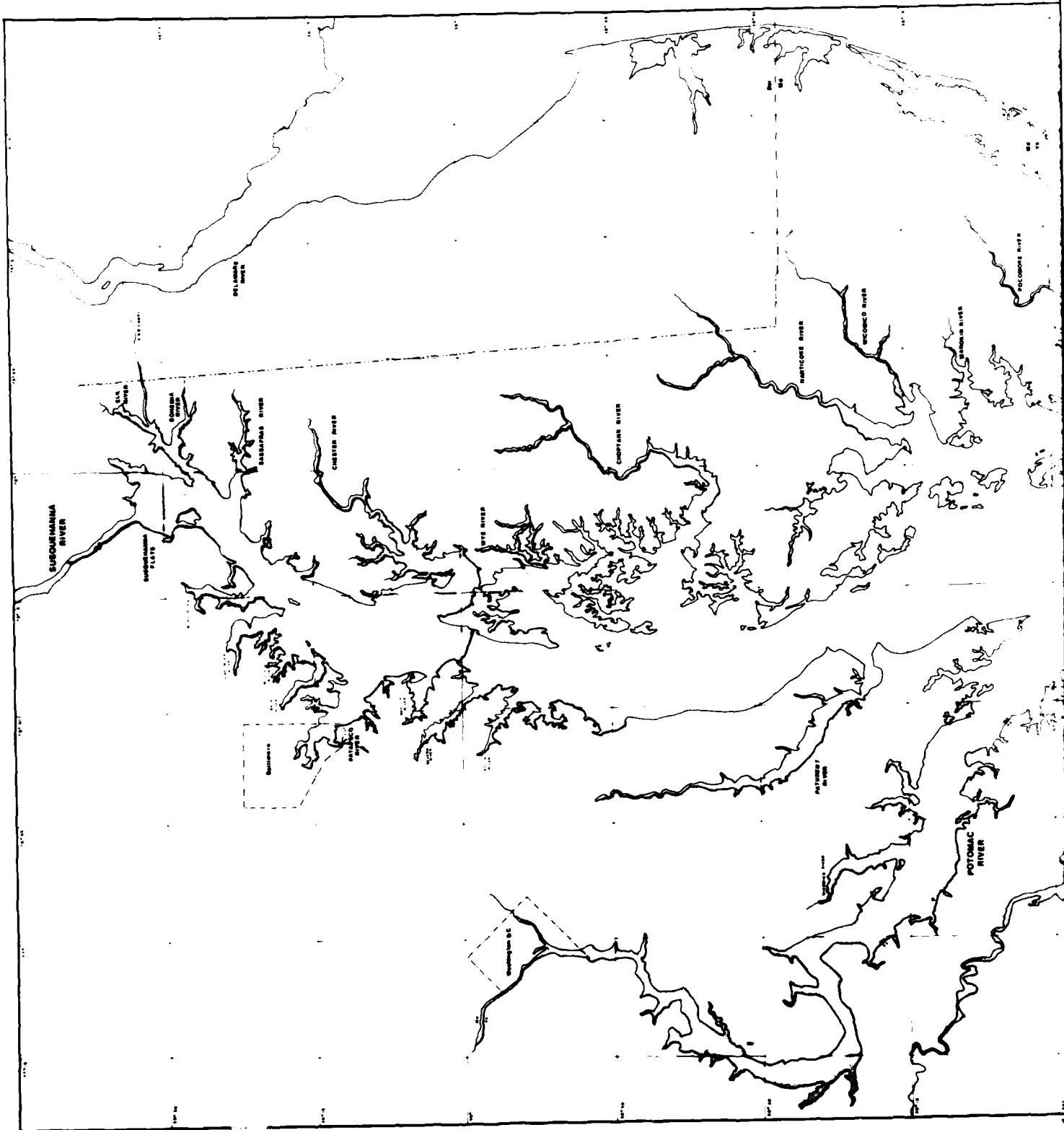


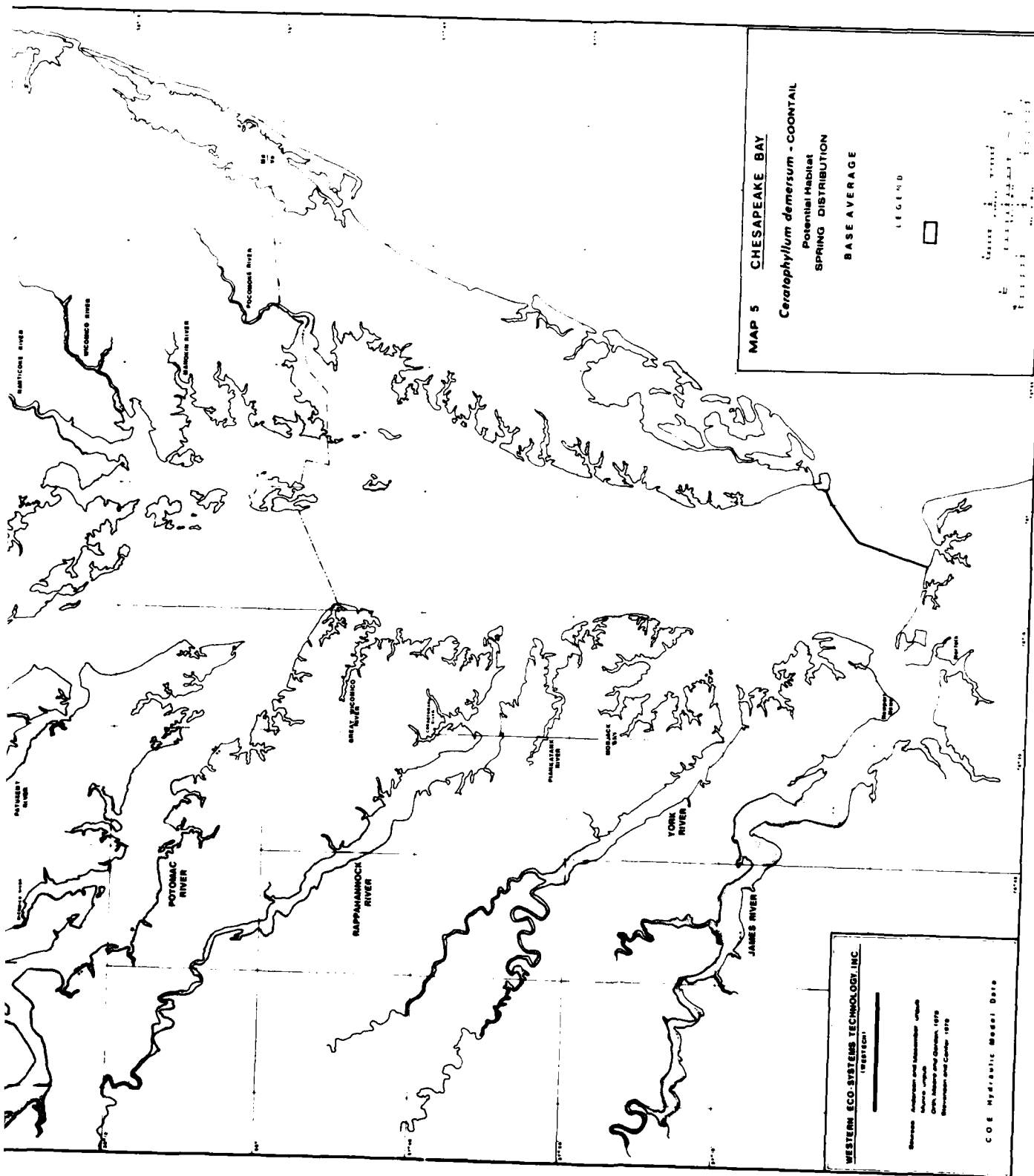


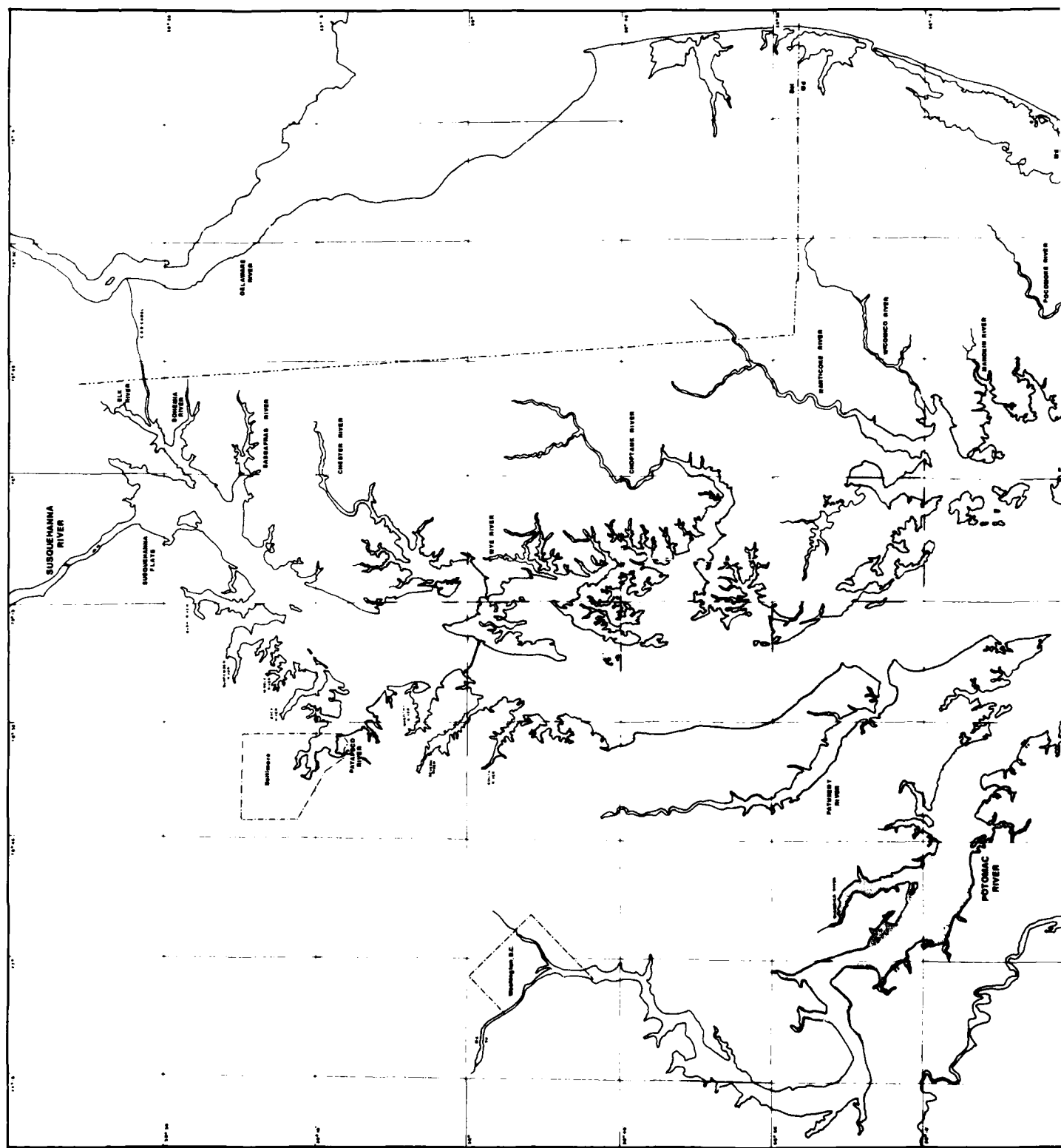






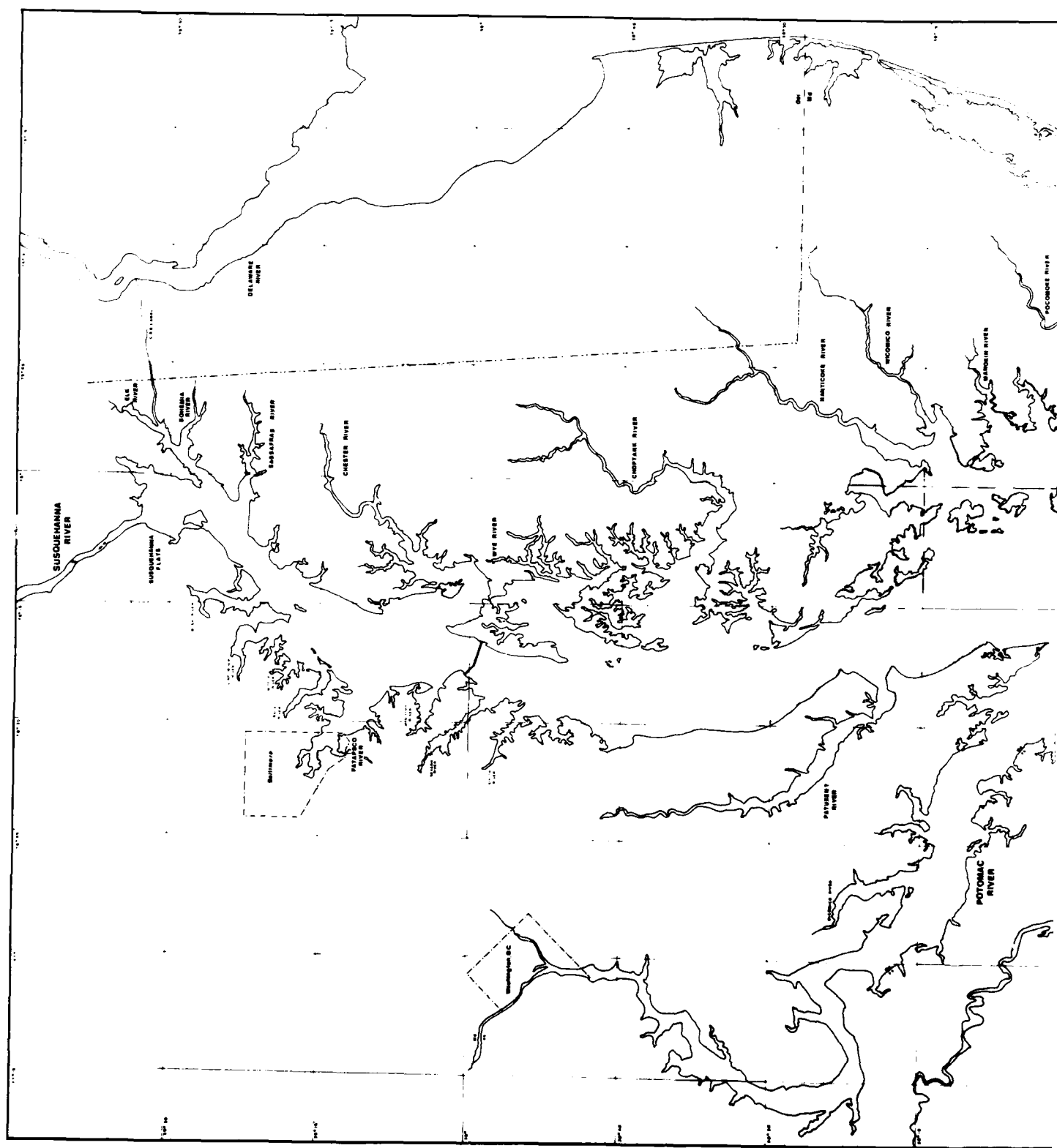


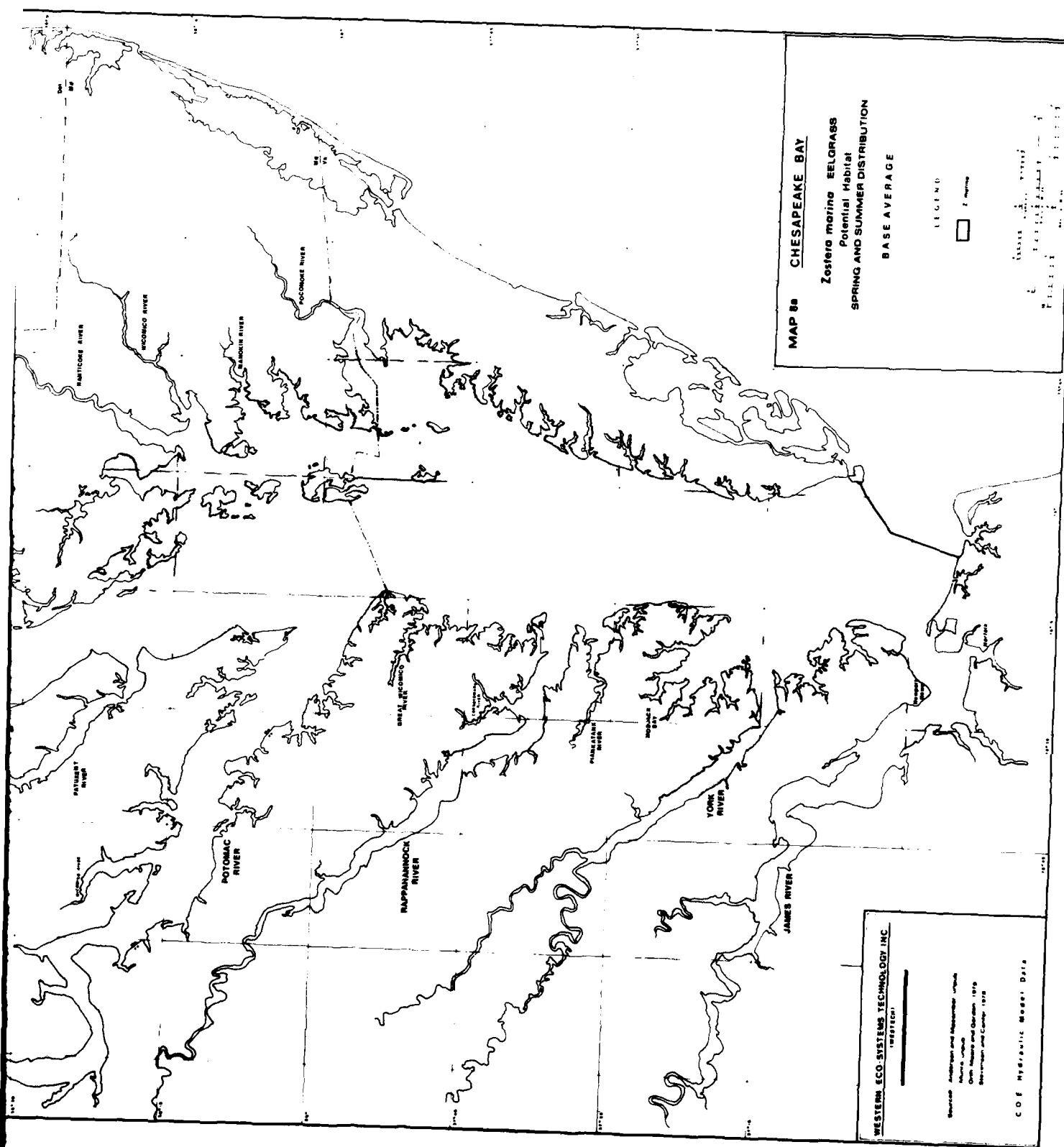




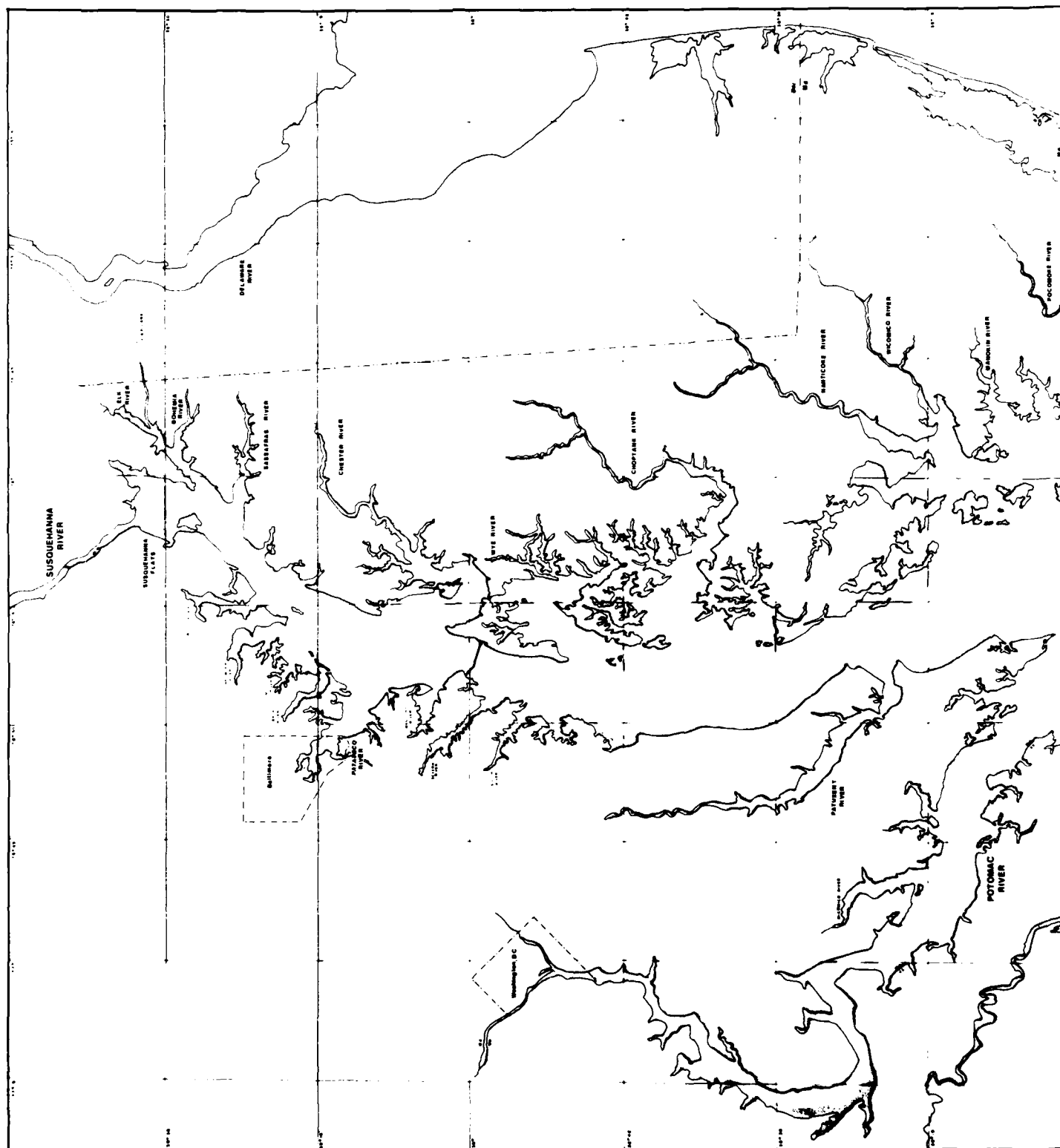


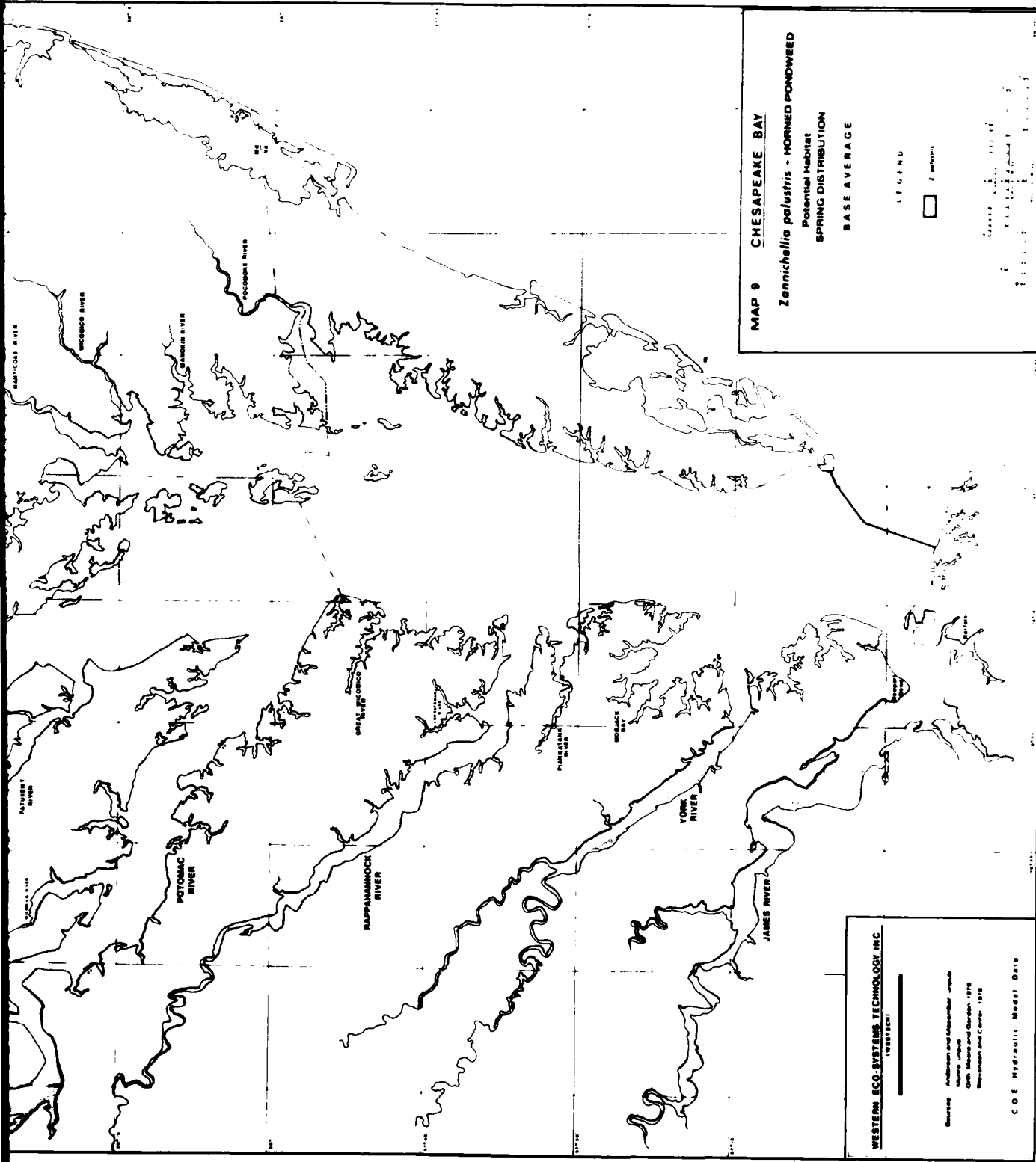


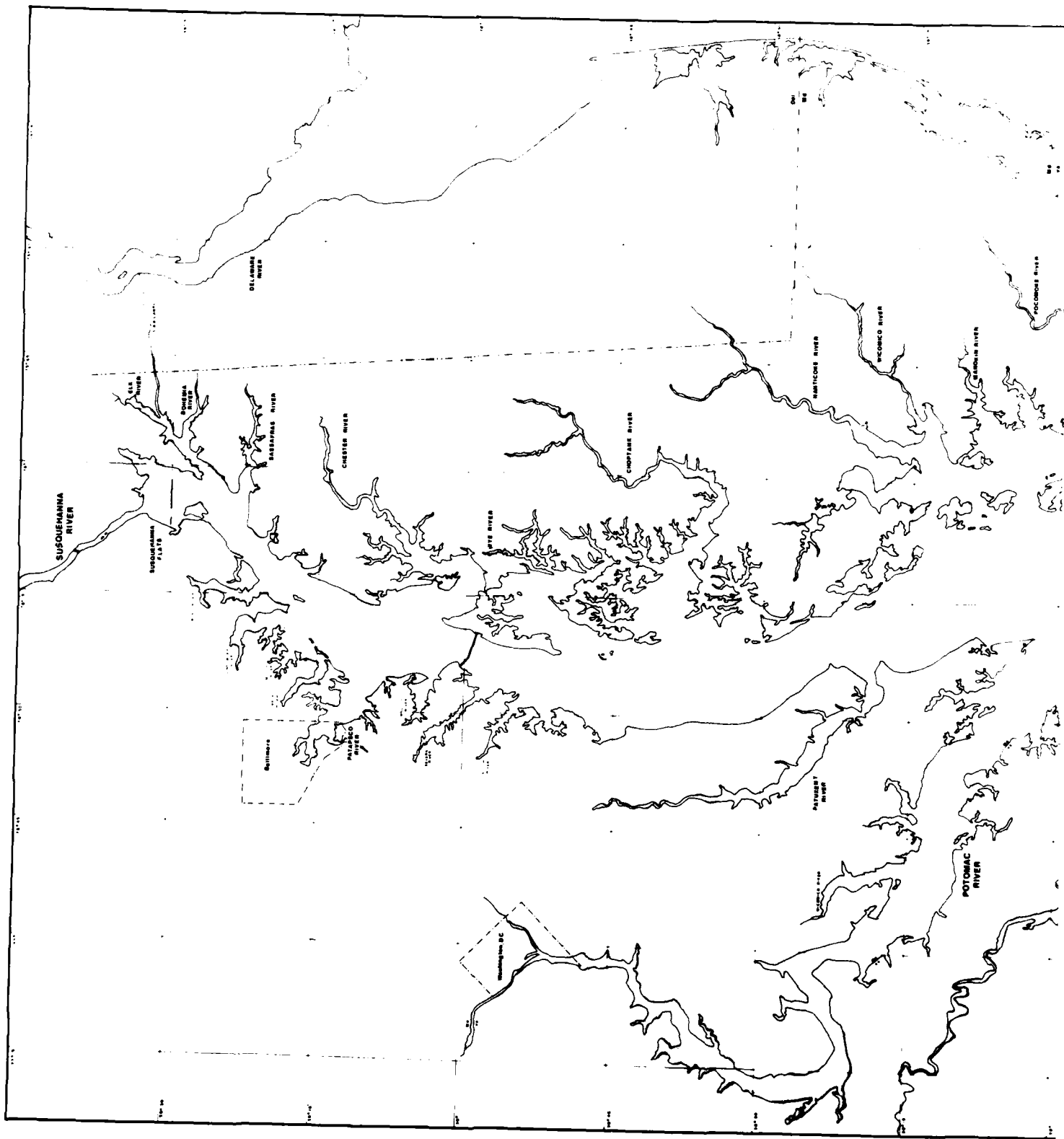


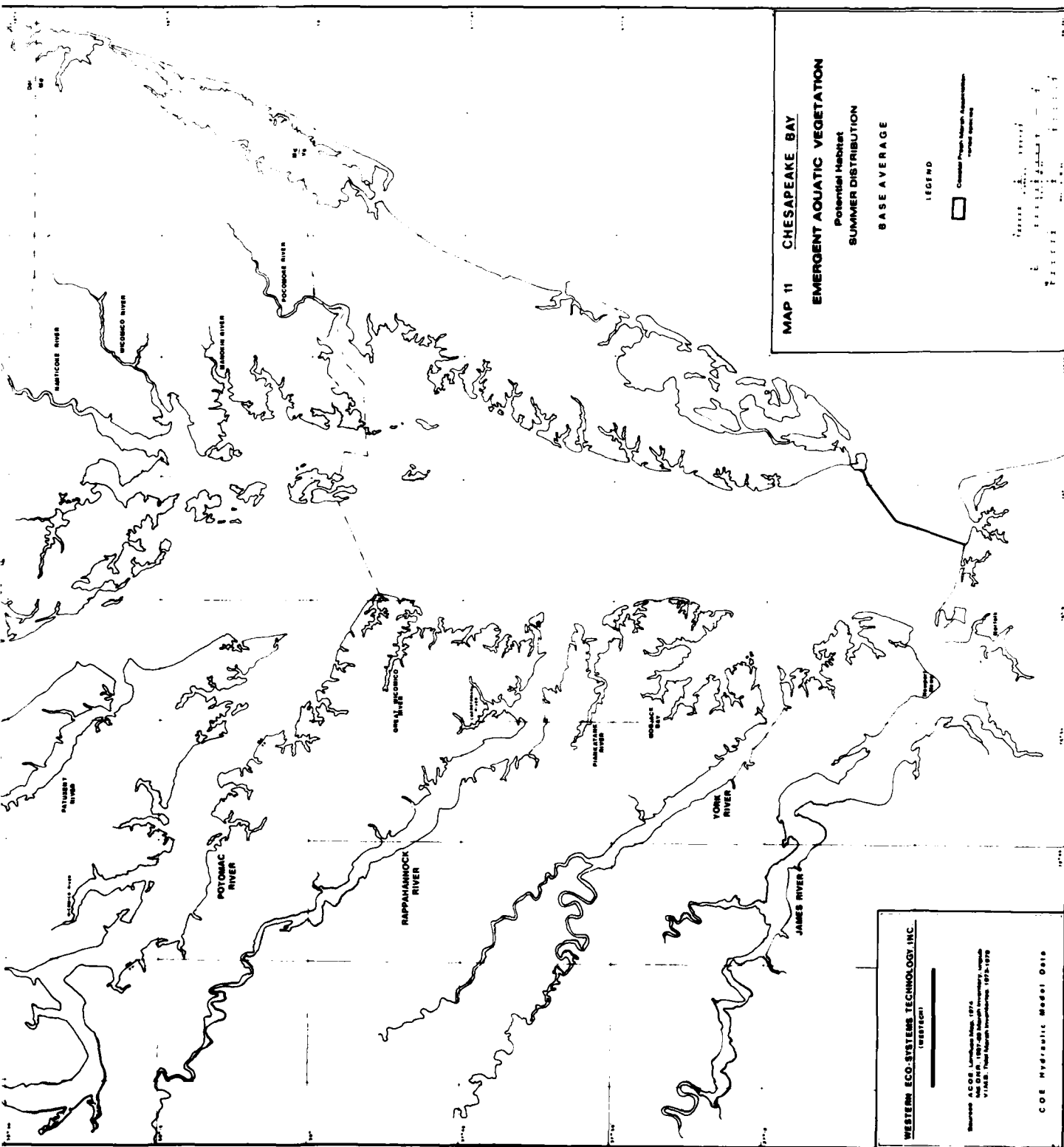


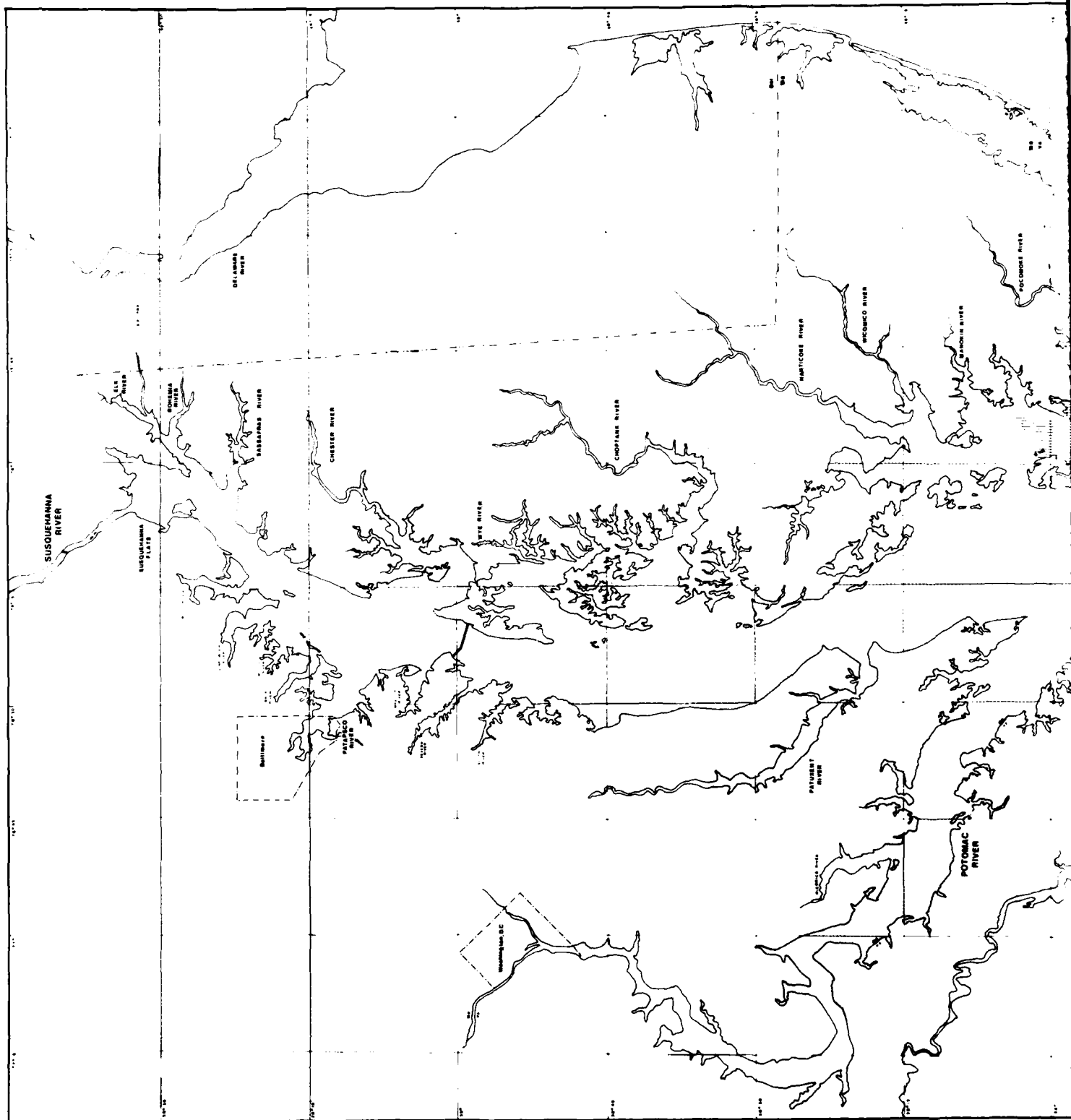
**WESTERN ECO-SYSTEMS TECHNOLOGY INC.**  
 (WESTECH)  
 Sources: Anderson and Anderson, 1974  
 Harris, 1974  
 Data: Harris and Gordon, 1974  
 Anderson and Gordon, 1974  
**COE Hydraulic Model Data**





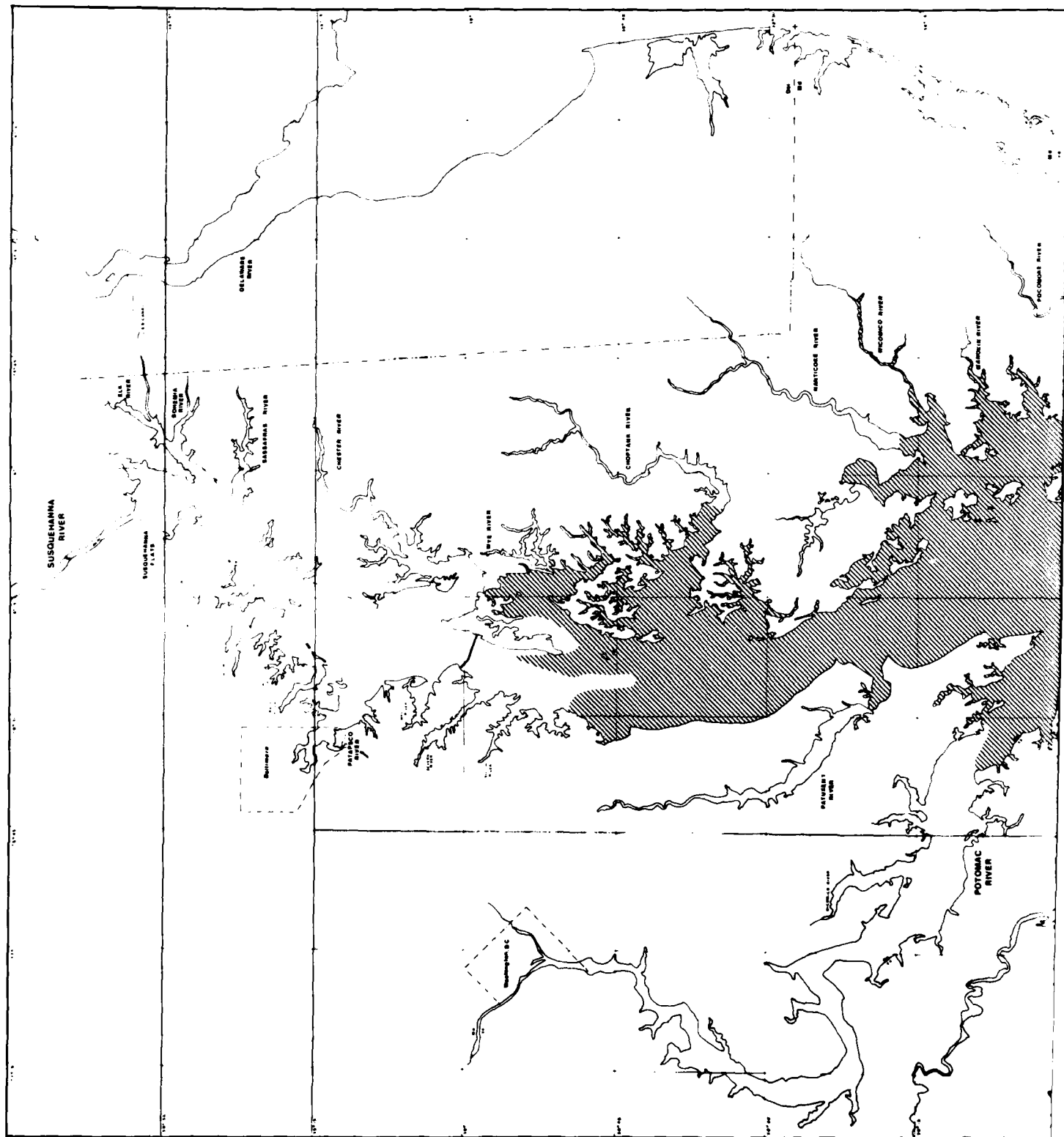


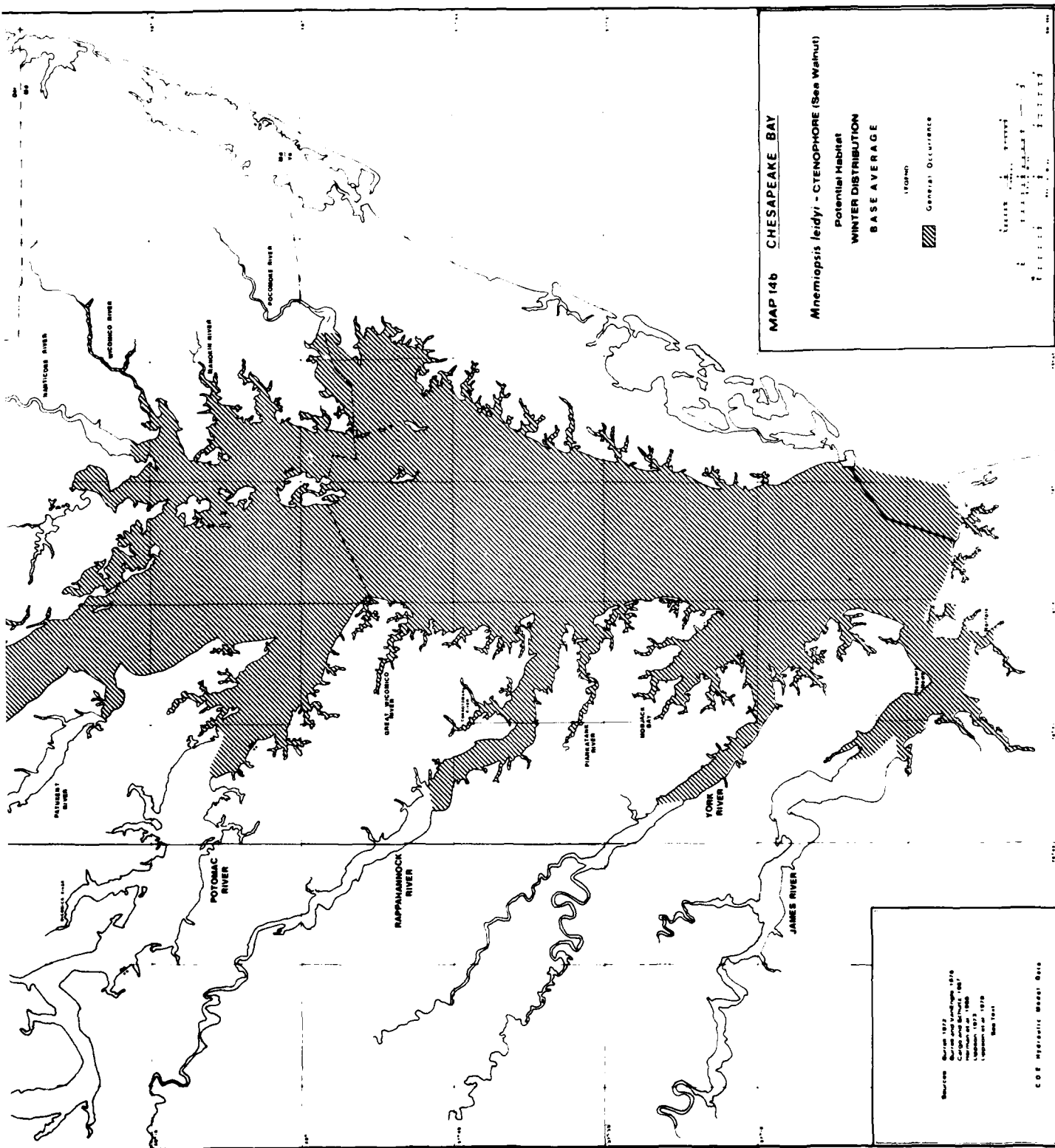


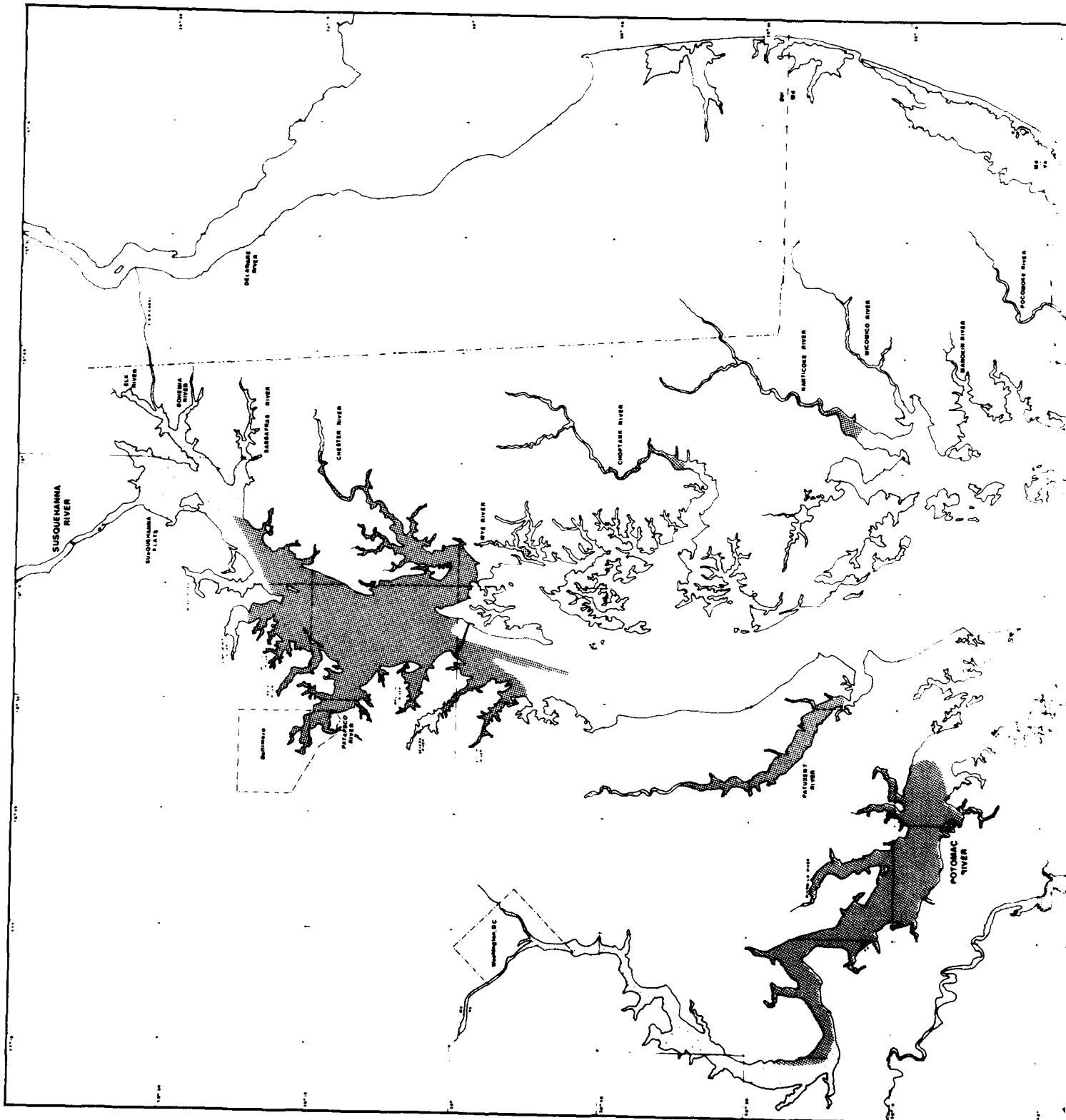


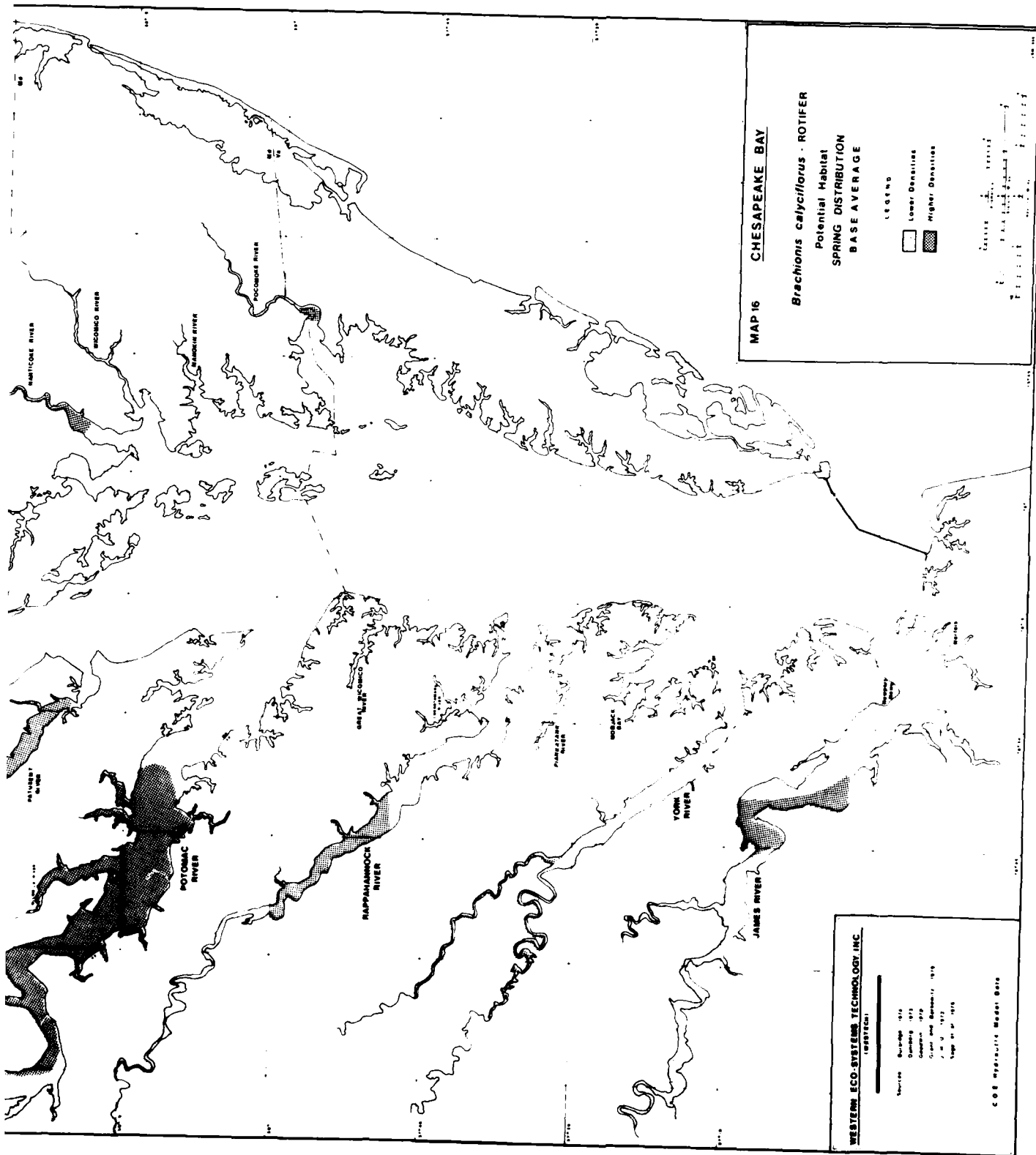


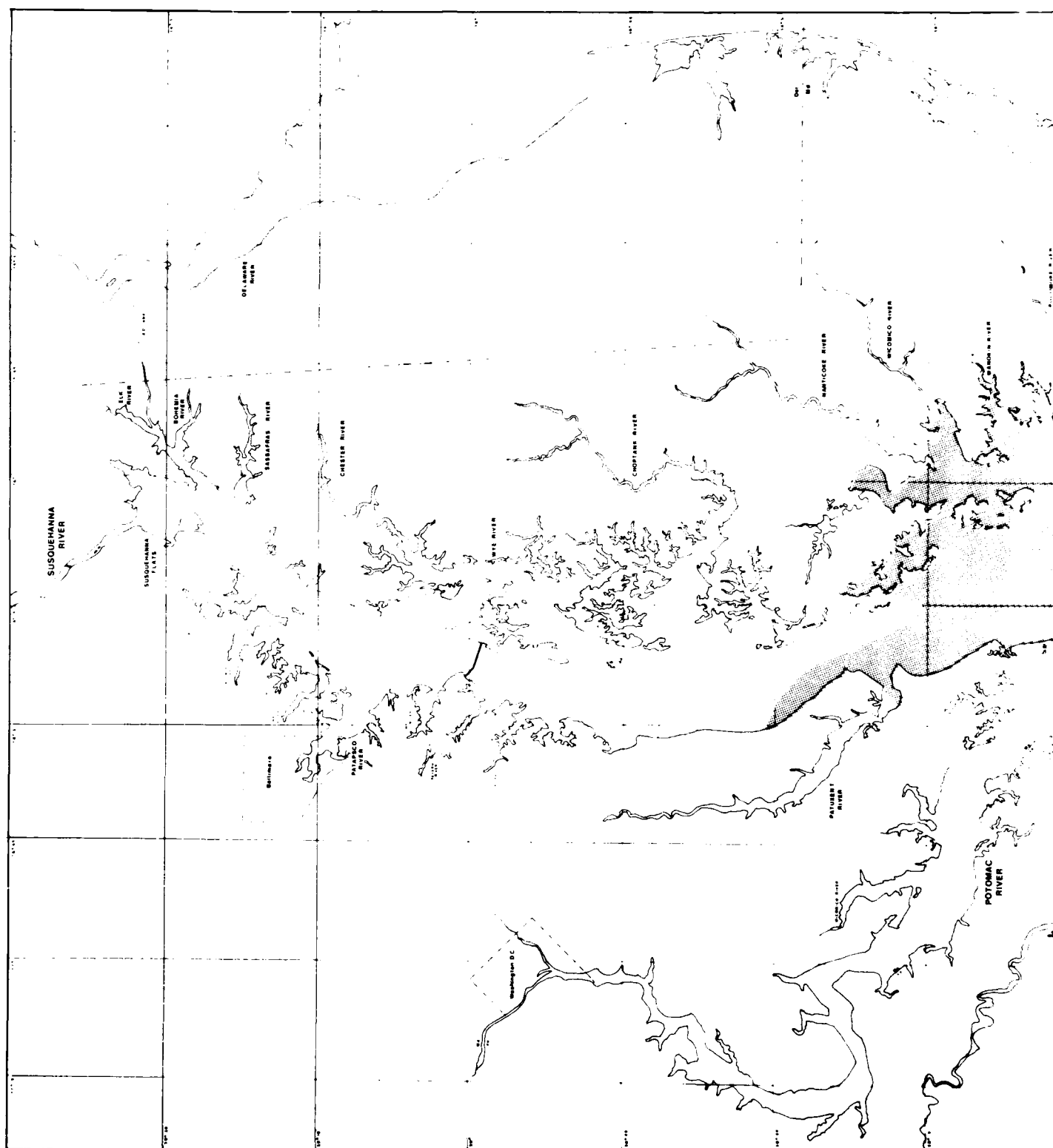


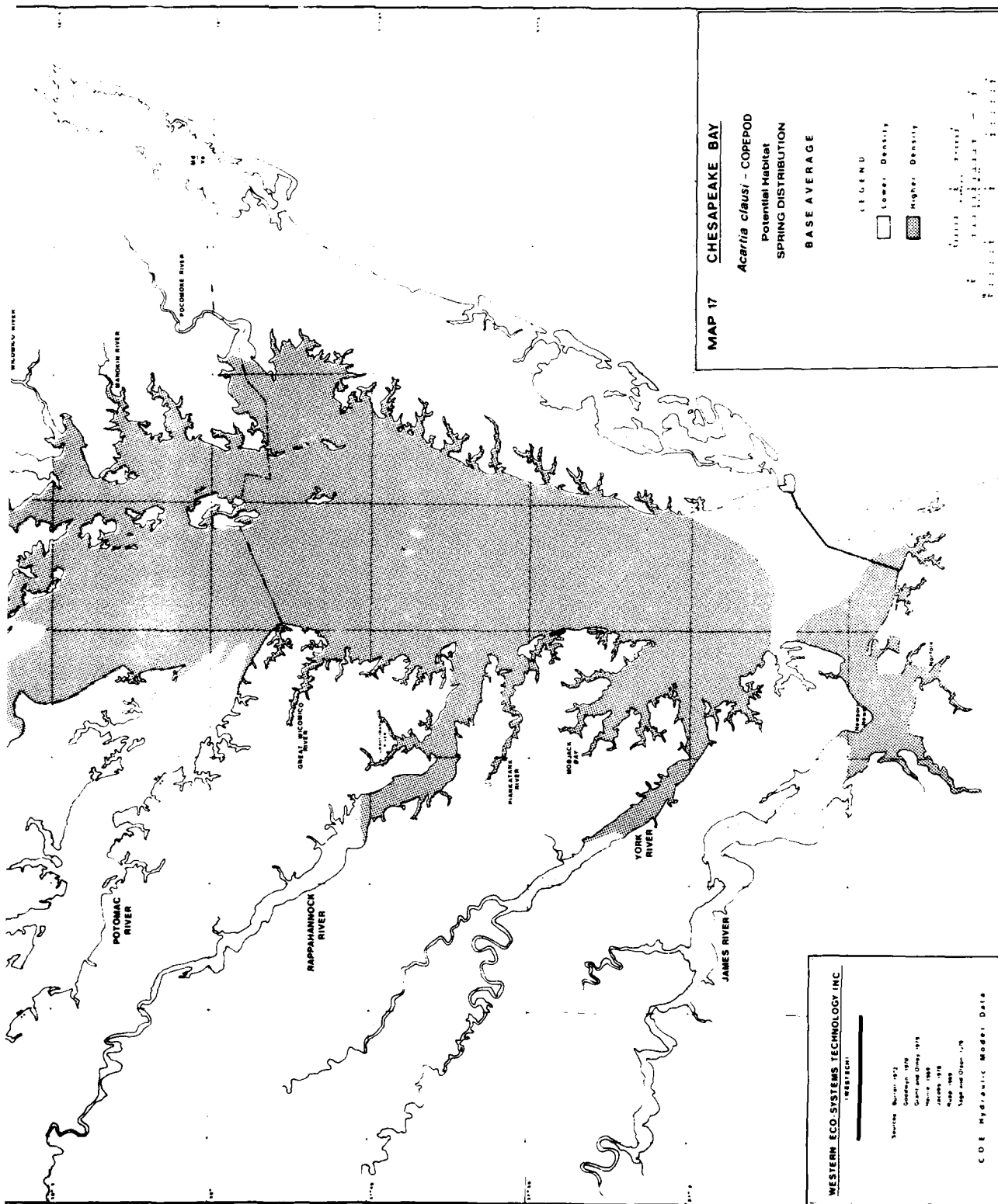


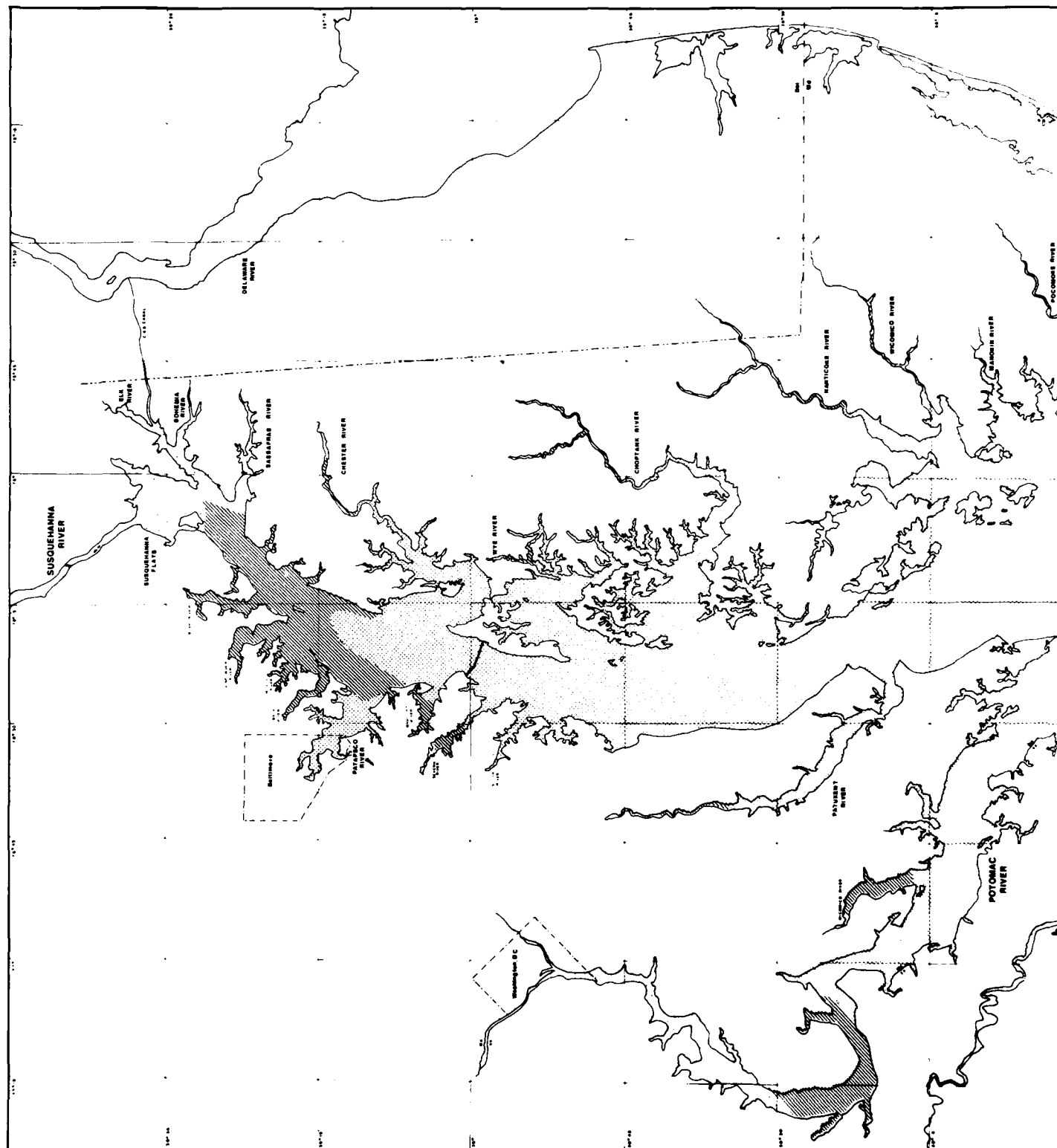




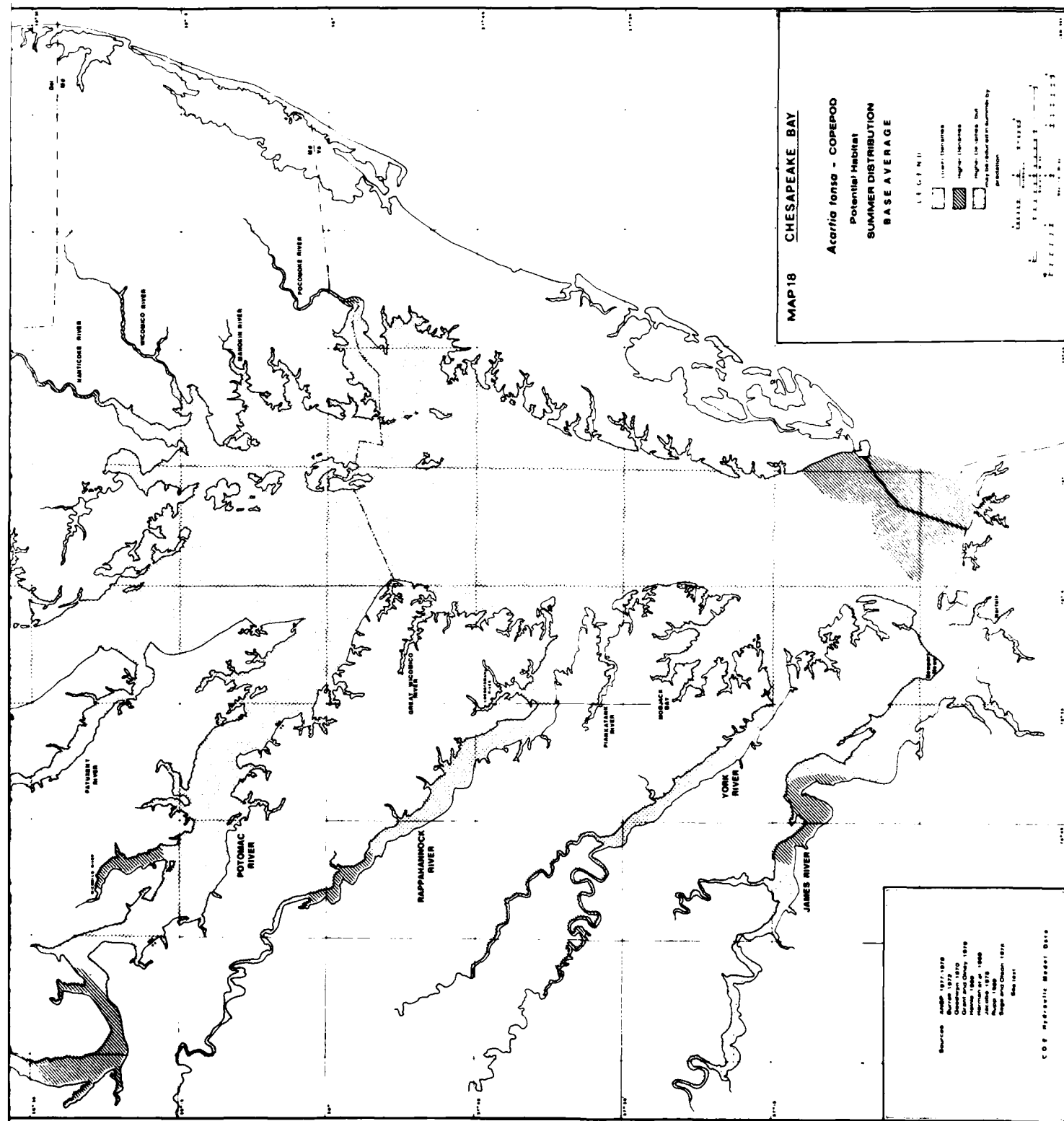


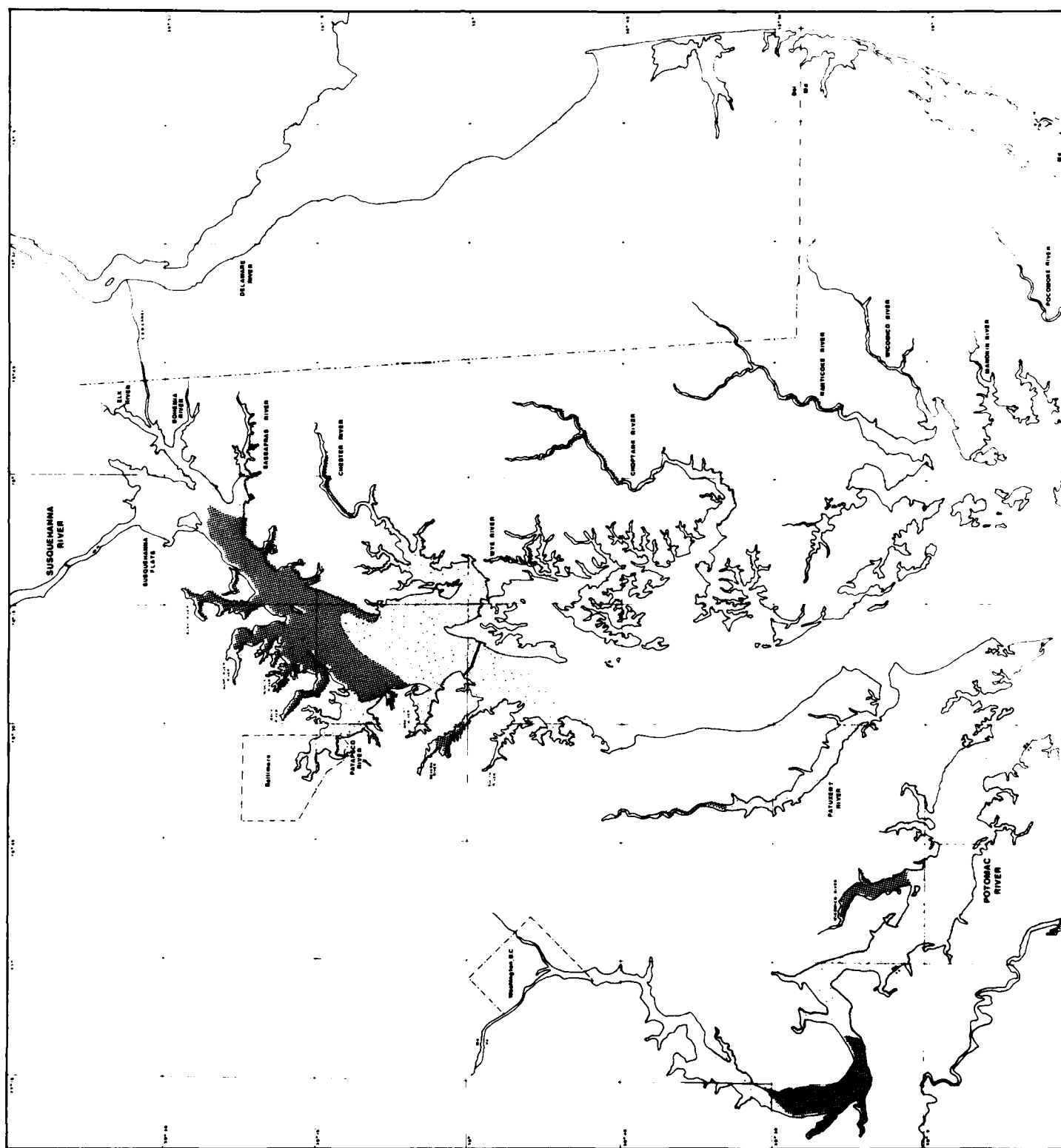


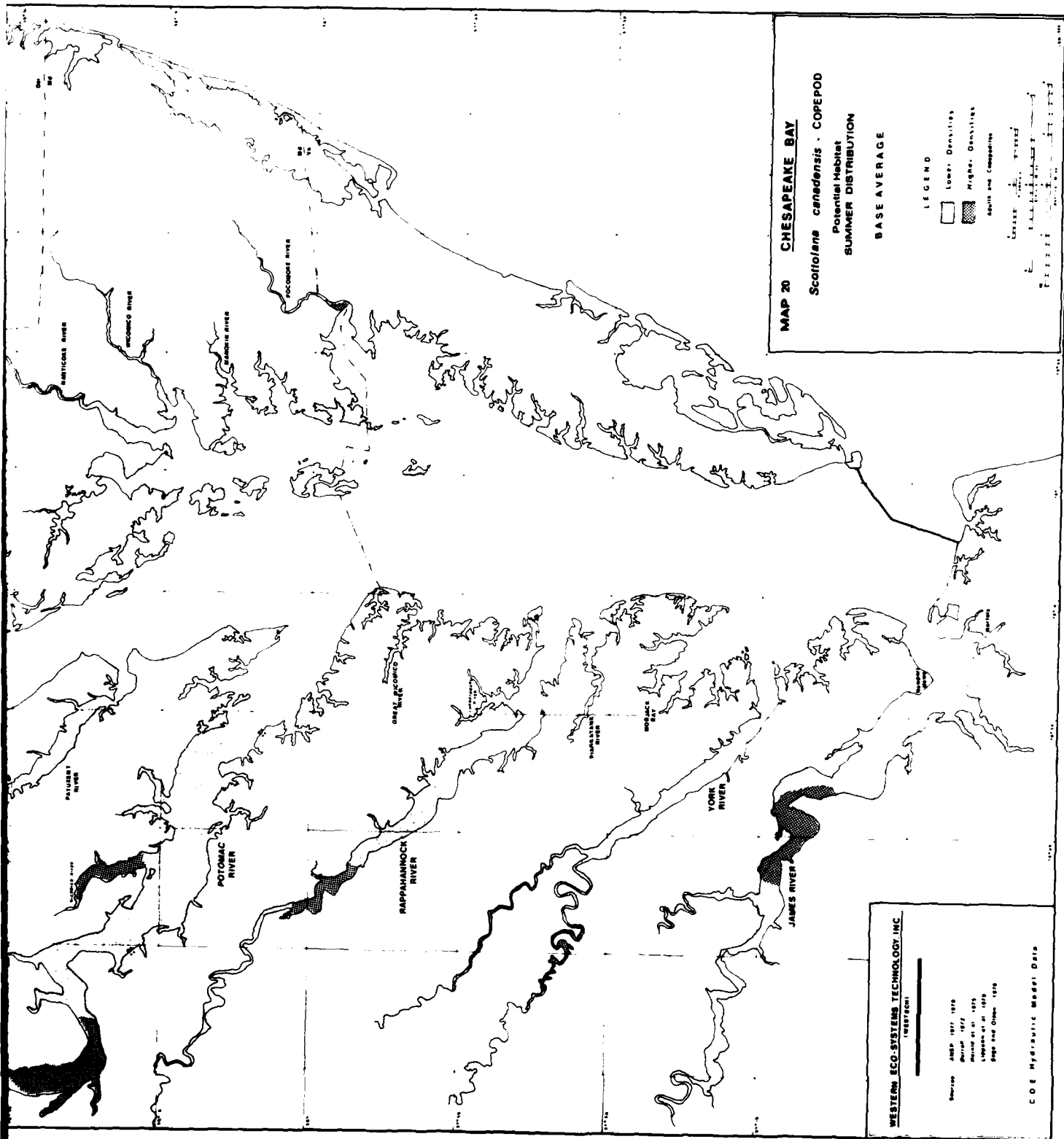


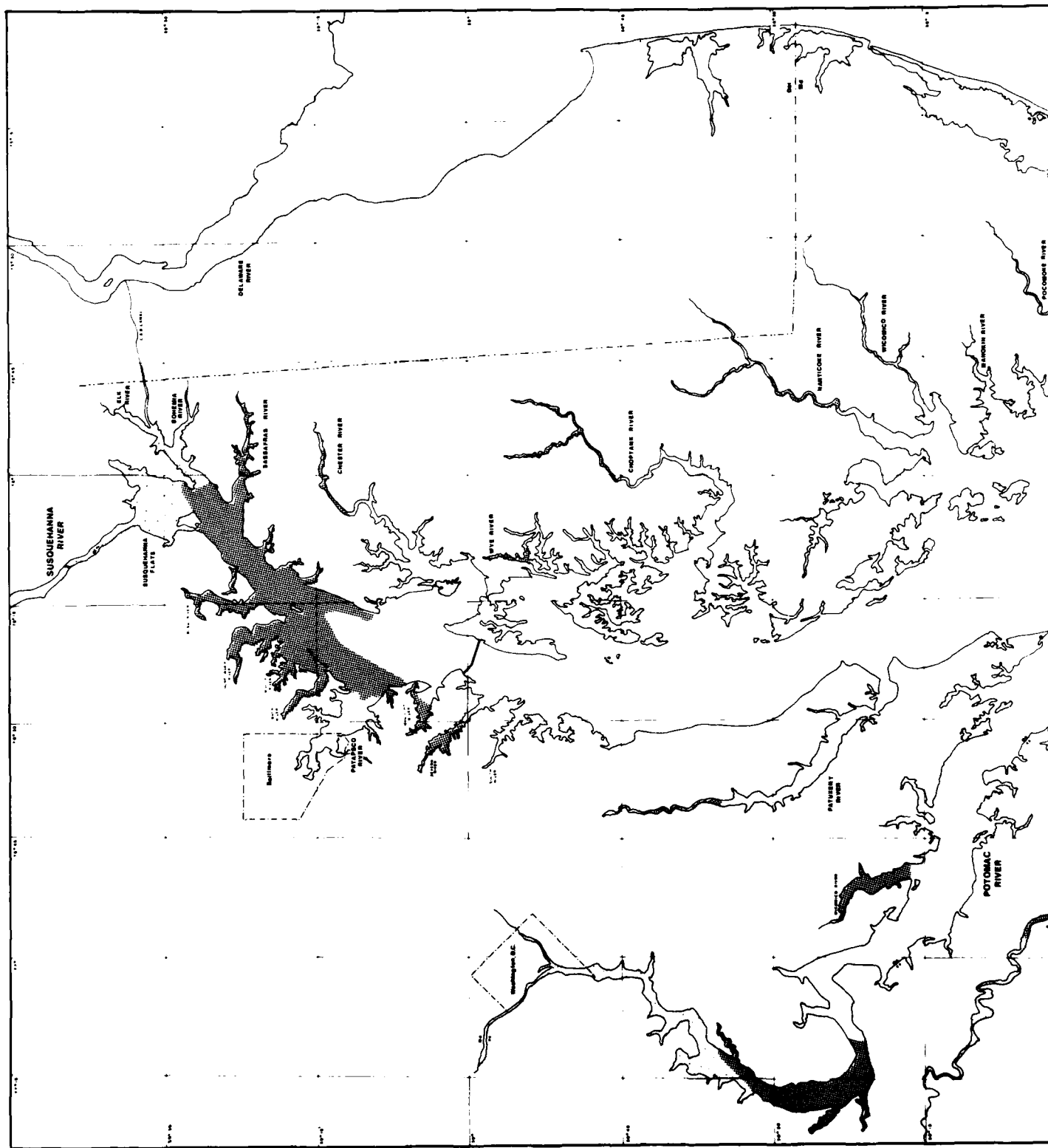


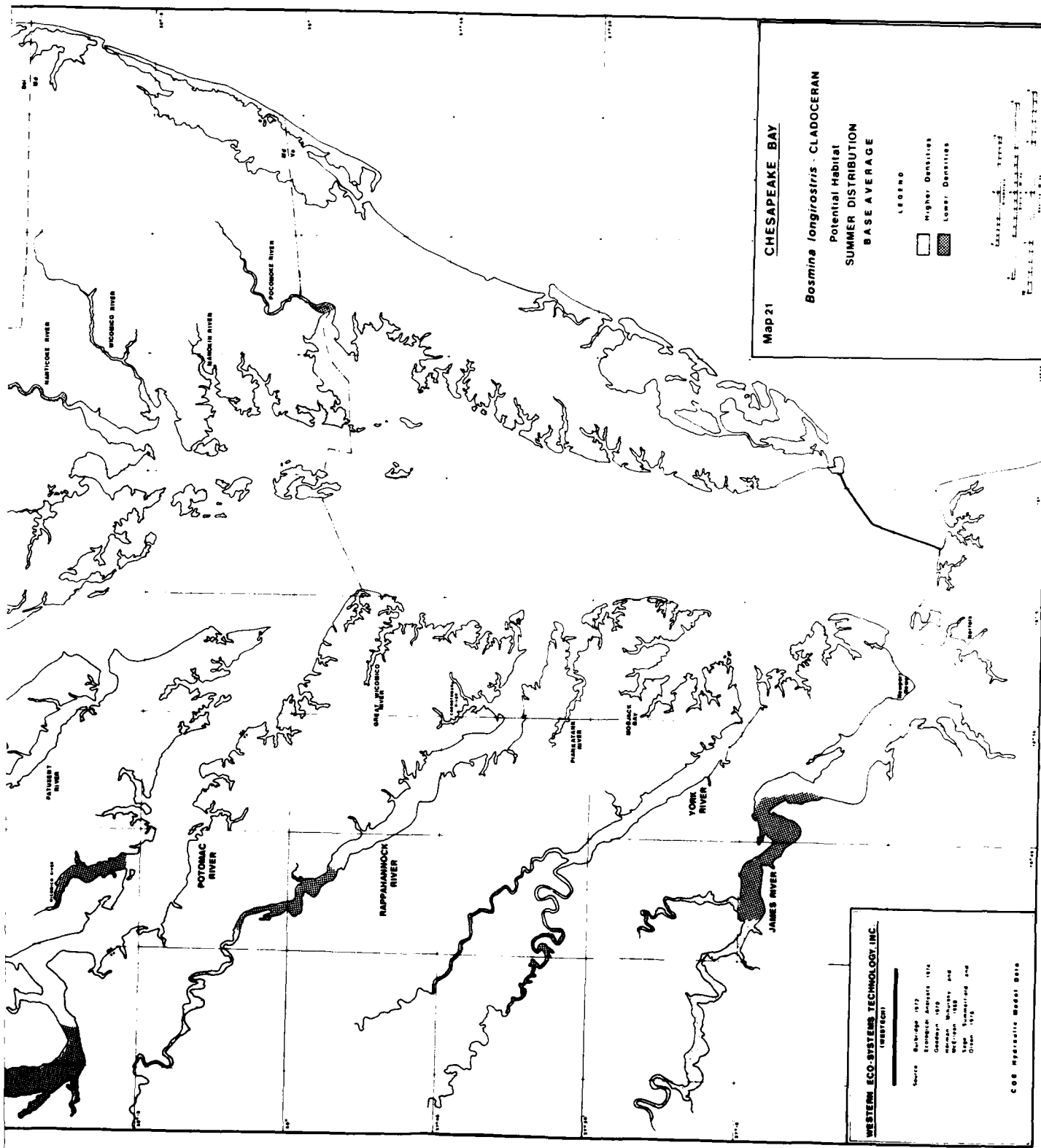


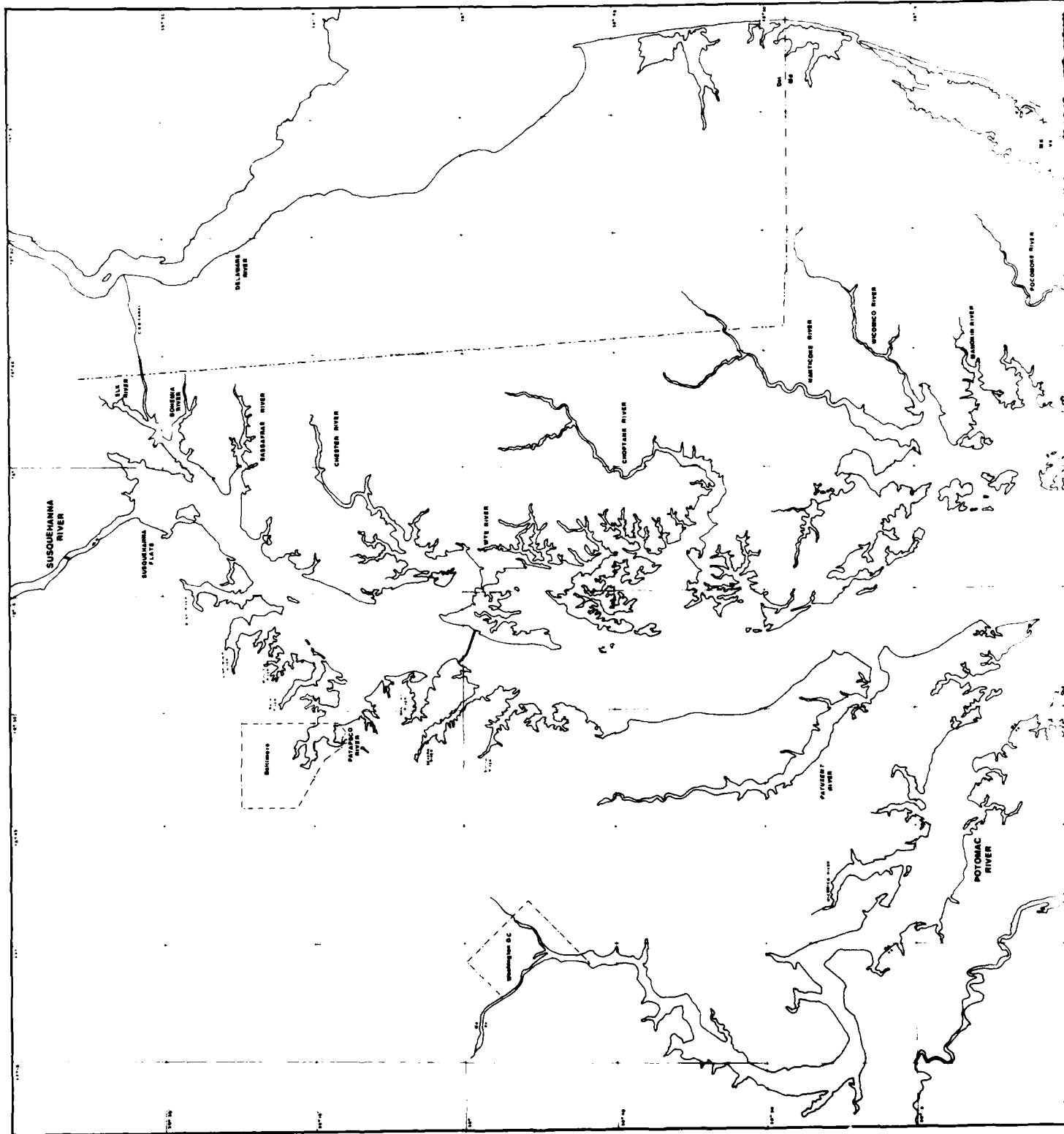


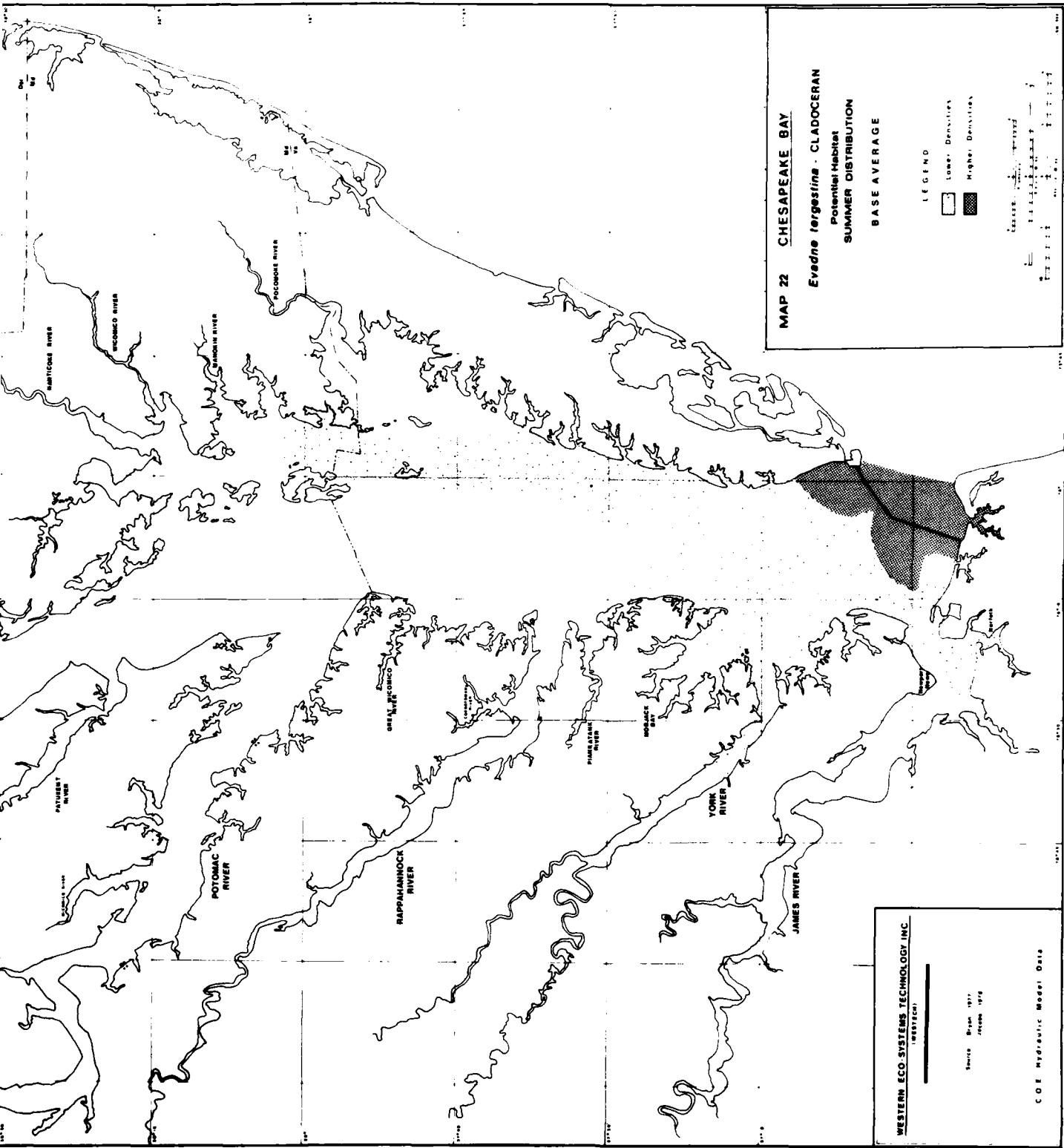


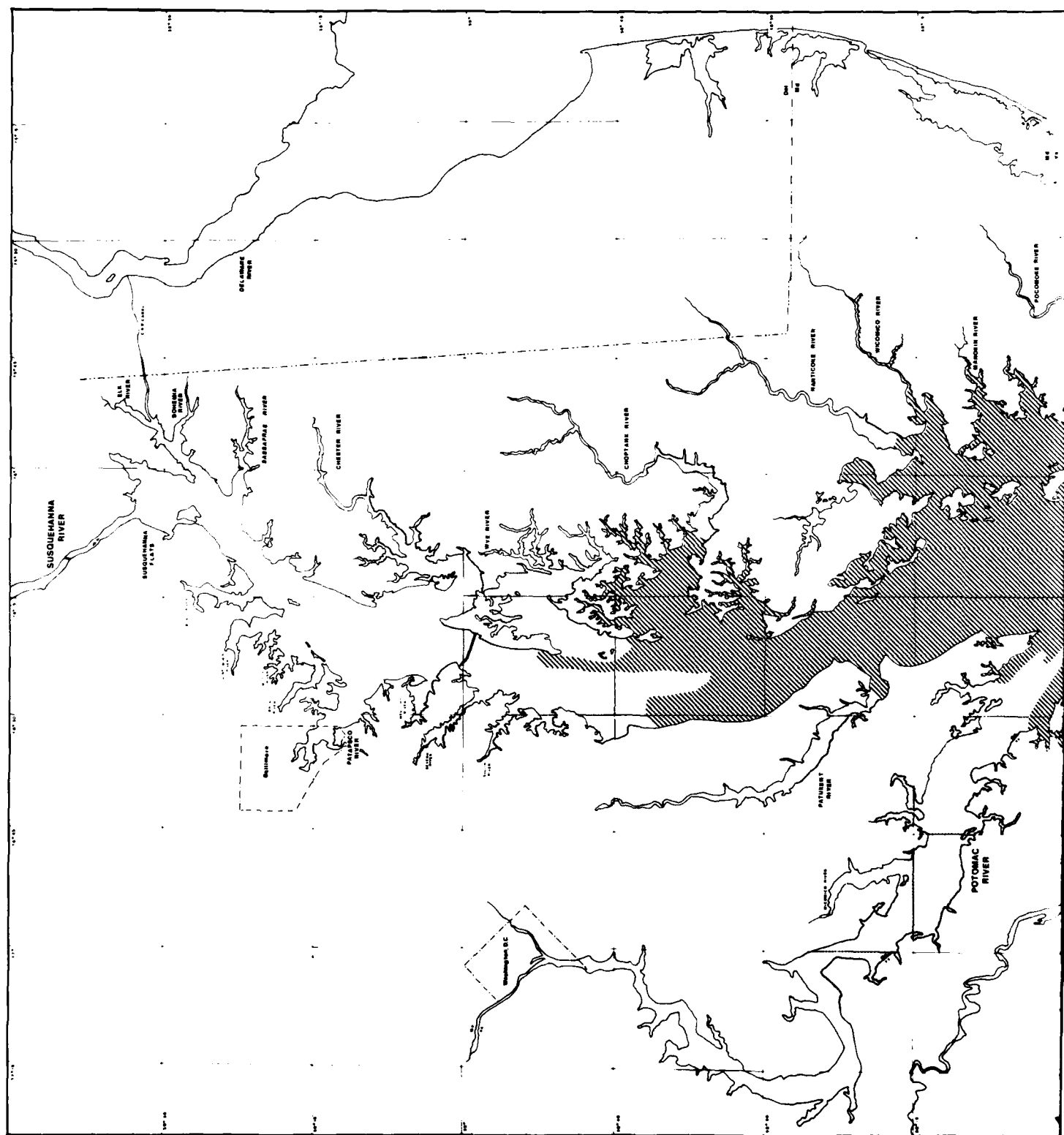




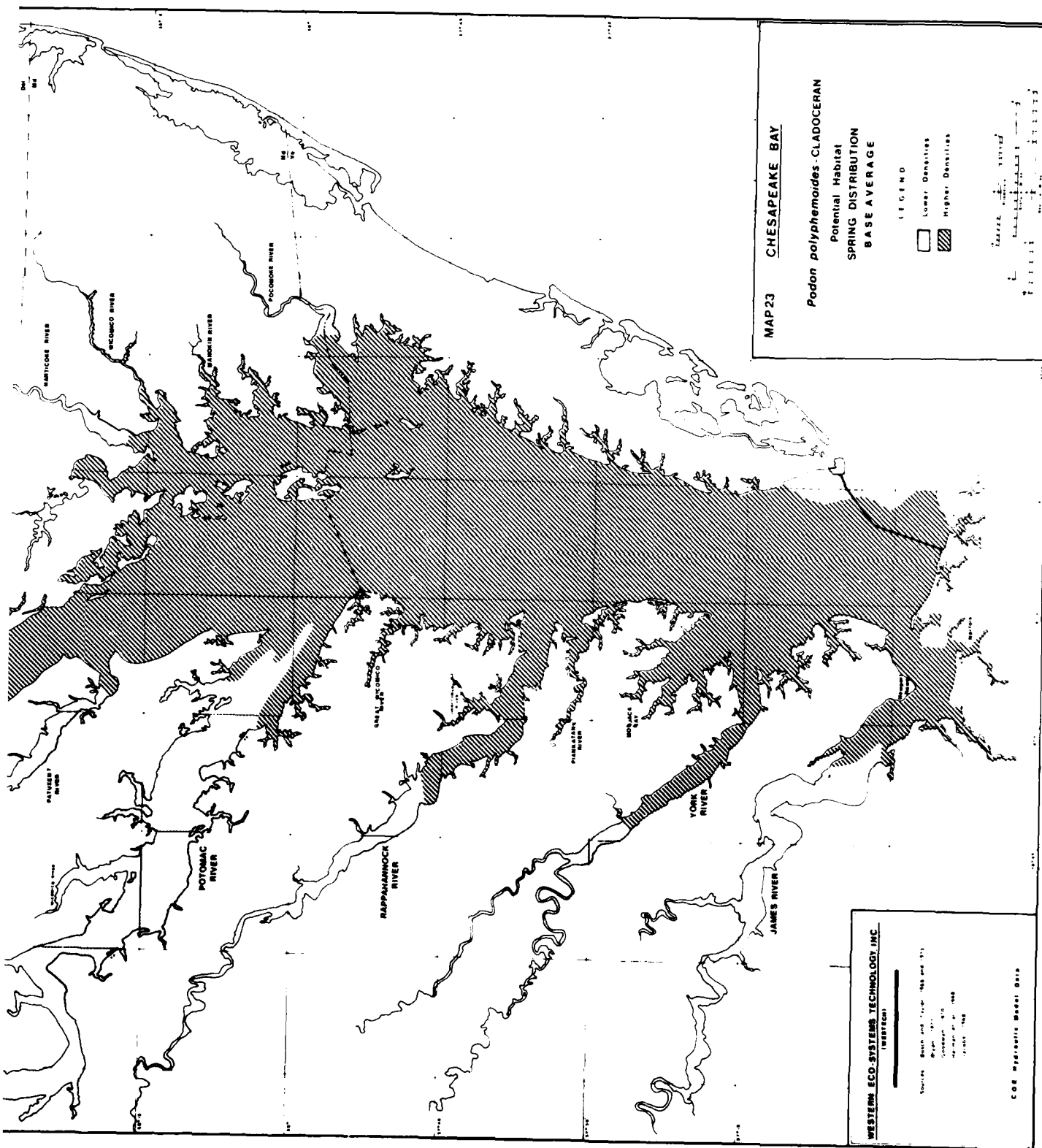


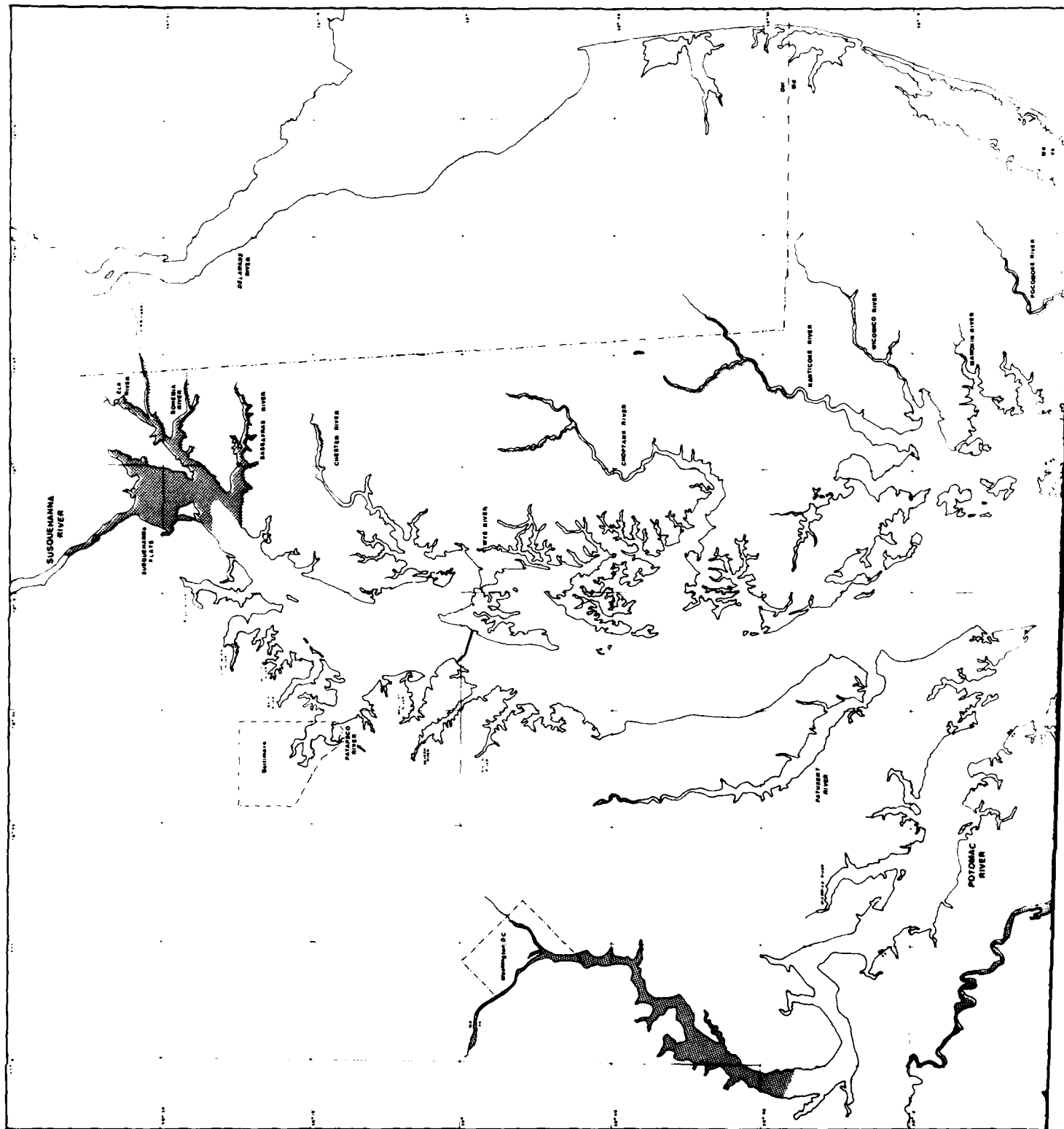


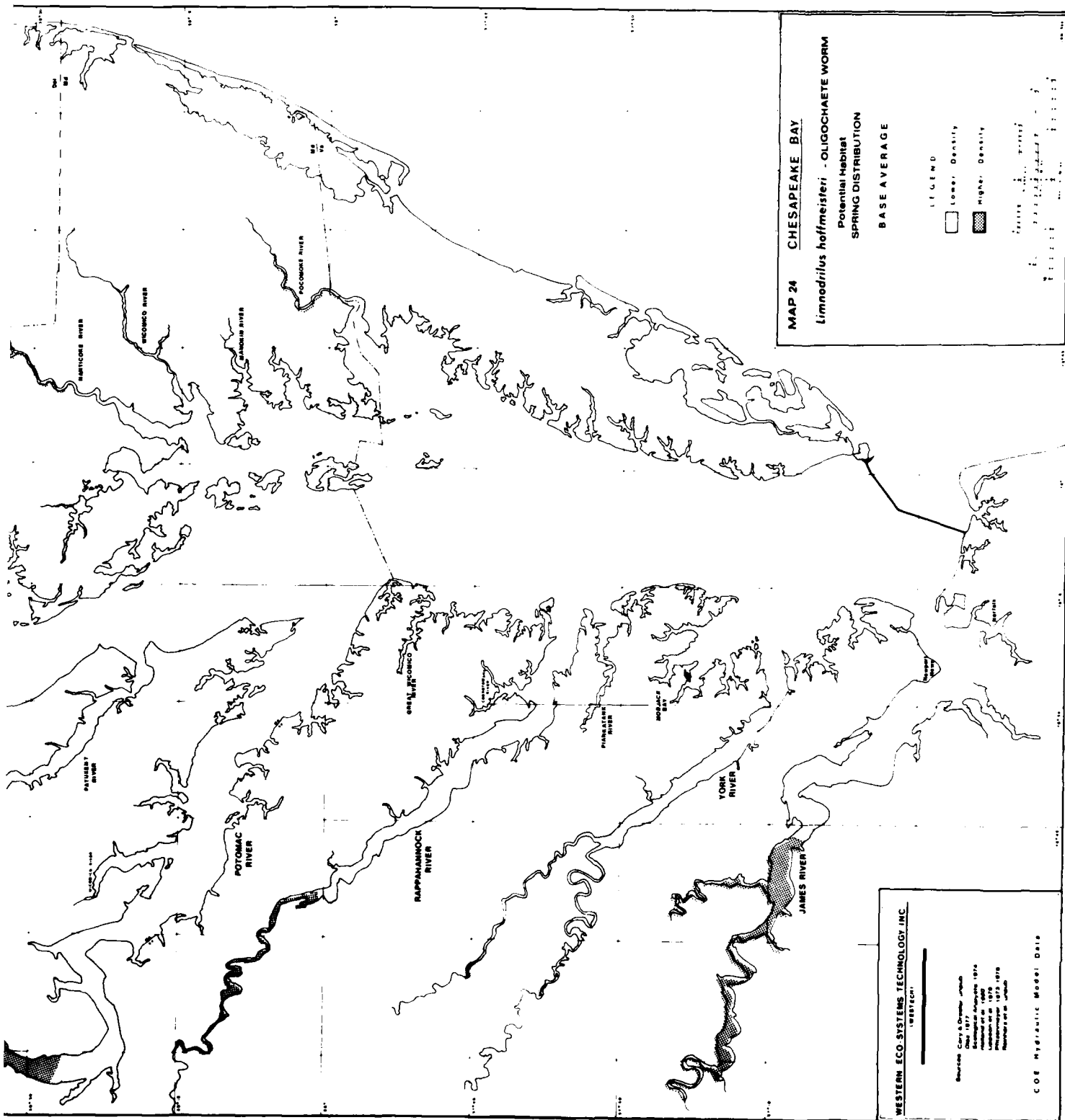












**MAP 24 CHESAPEAKE BAY**

**limnodrilus hoffmeisteri - OLIGOCHAETE WORM**

Potential Habitat  
SPRING DISTRIBUTION  
BASE AVERAGE

**LEGEND**

Low Density: [White box]

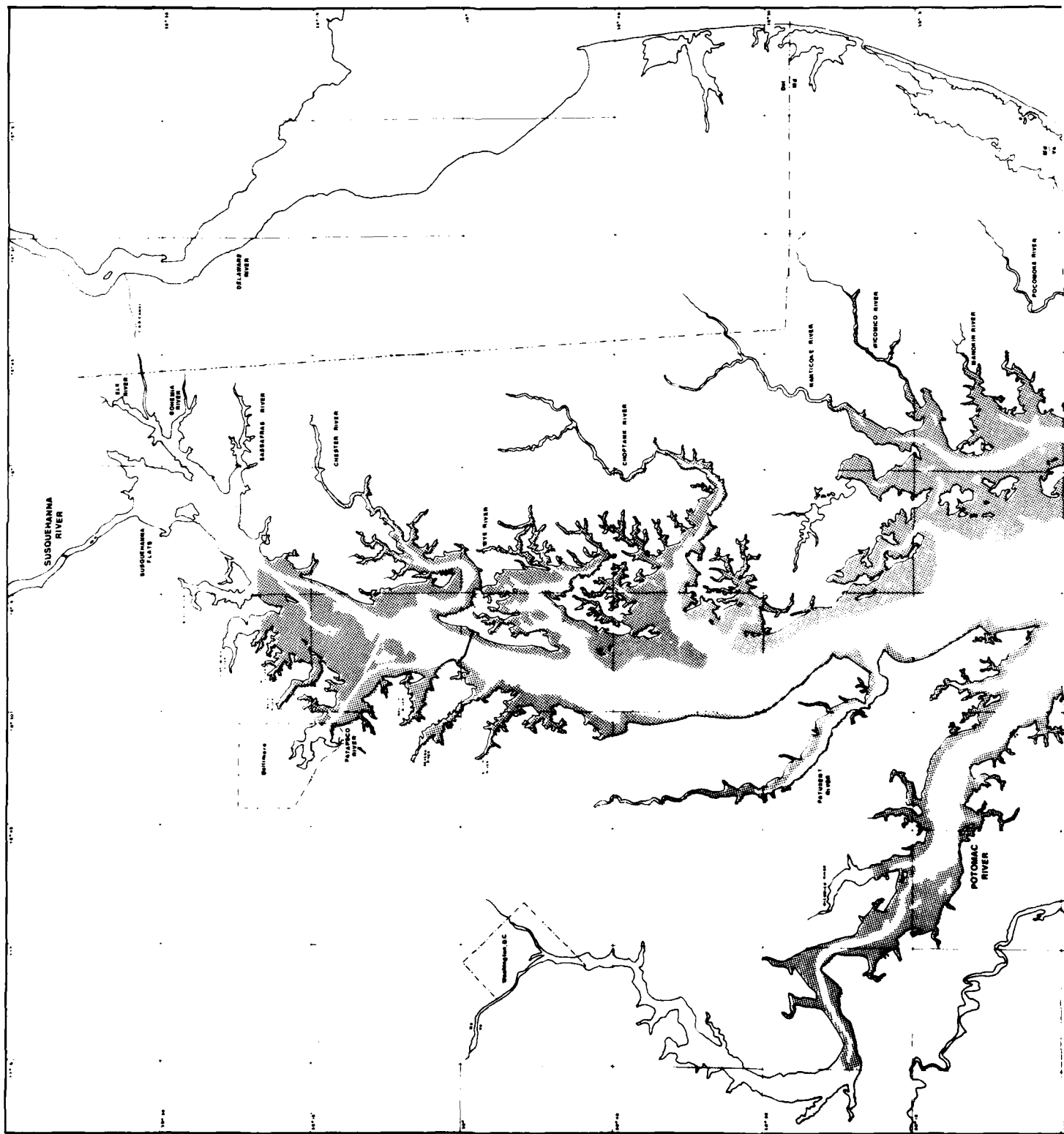
High Density: [Shaded box]

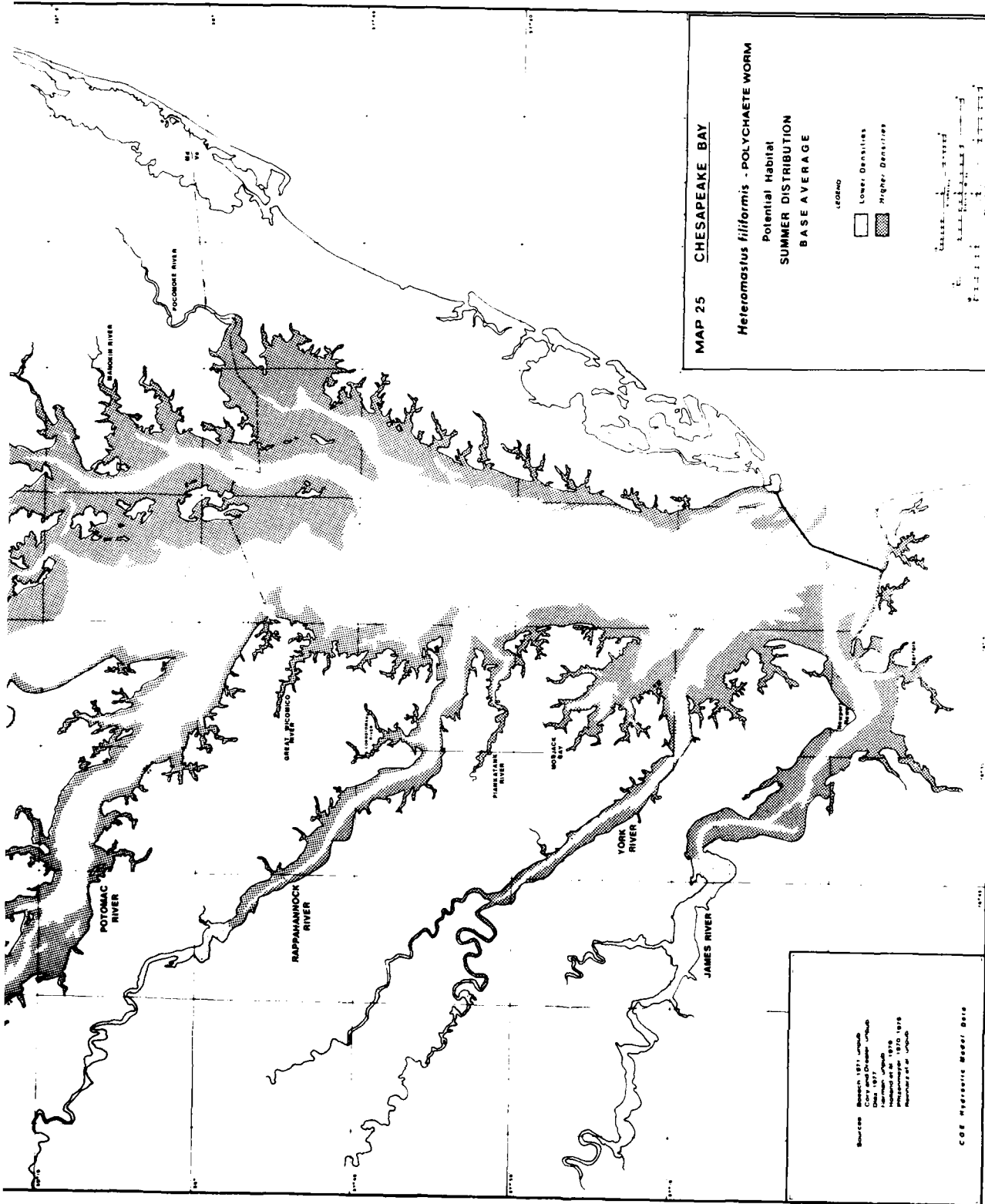
Scale: 0 10 Miles

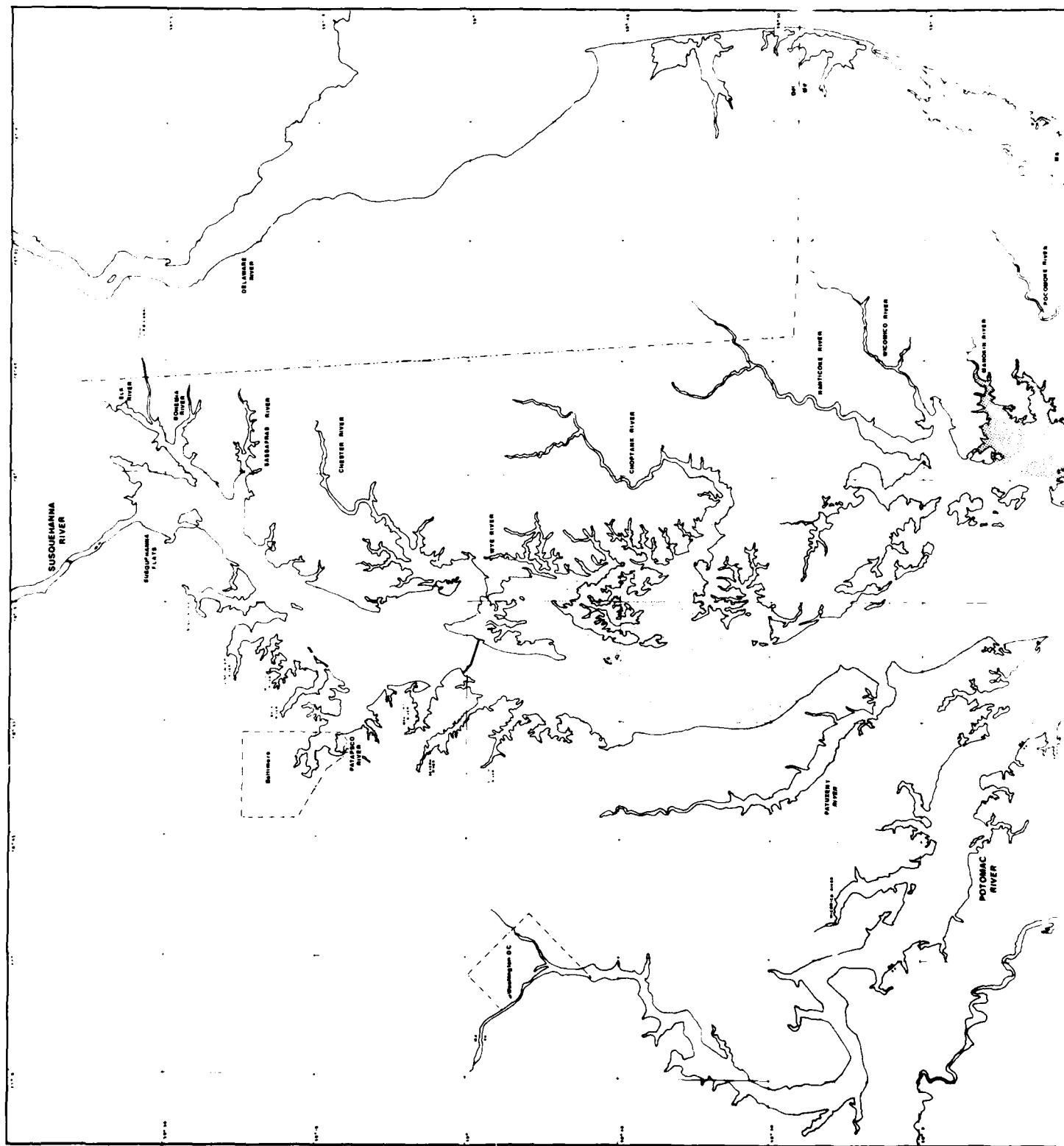
**WESTERN ECO-SYSTEMS TECHNOLOGY INC.**  
[Logo]

Source: Gray & Dwyer, 1974  
[Logo]  
Estimated August 1974  
Estimated 10 to 1000  
Estimated 1000 to 10000  
Estimated 10000 to 100000  
Estimated 100000 to 1000000

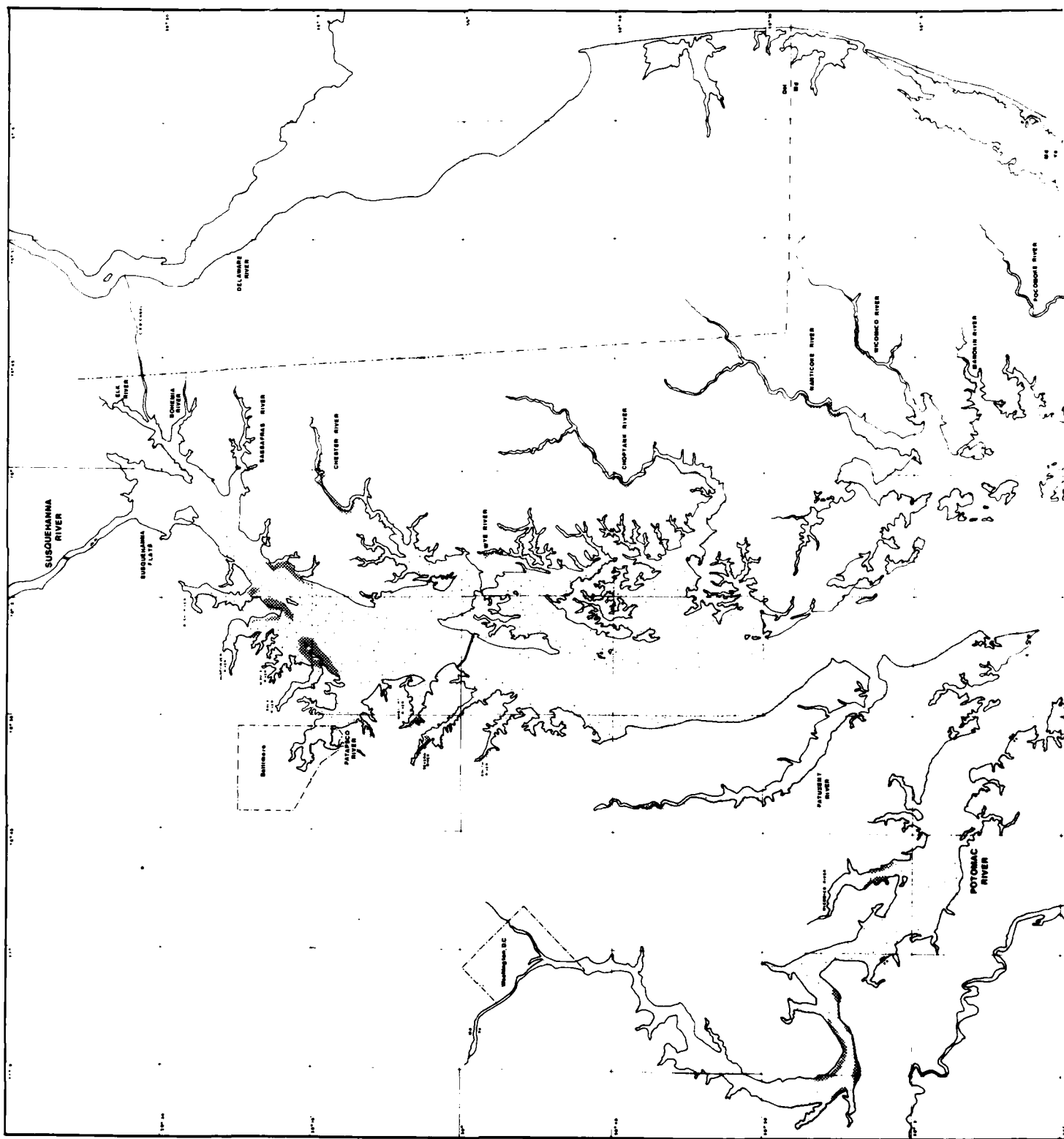
COE Hydraulic Model Data



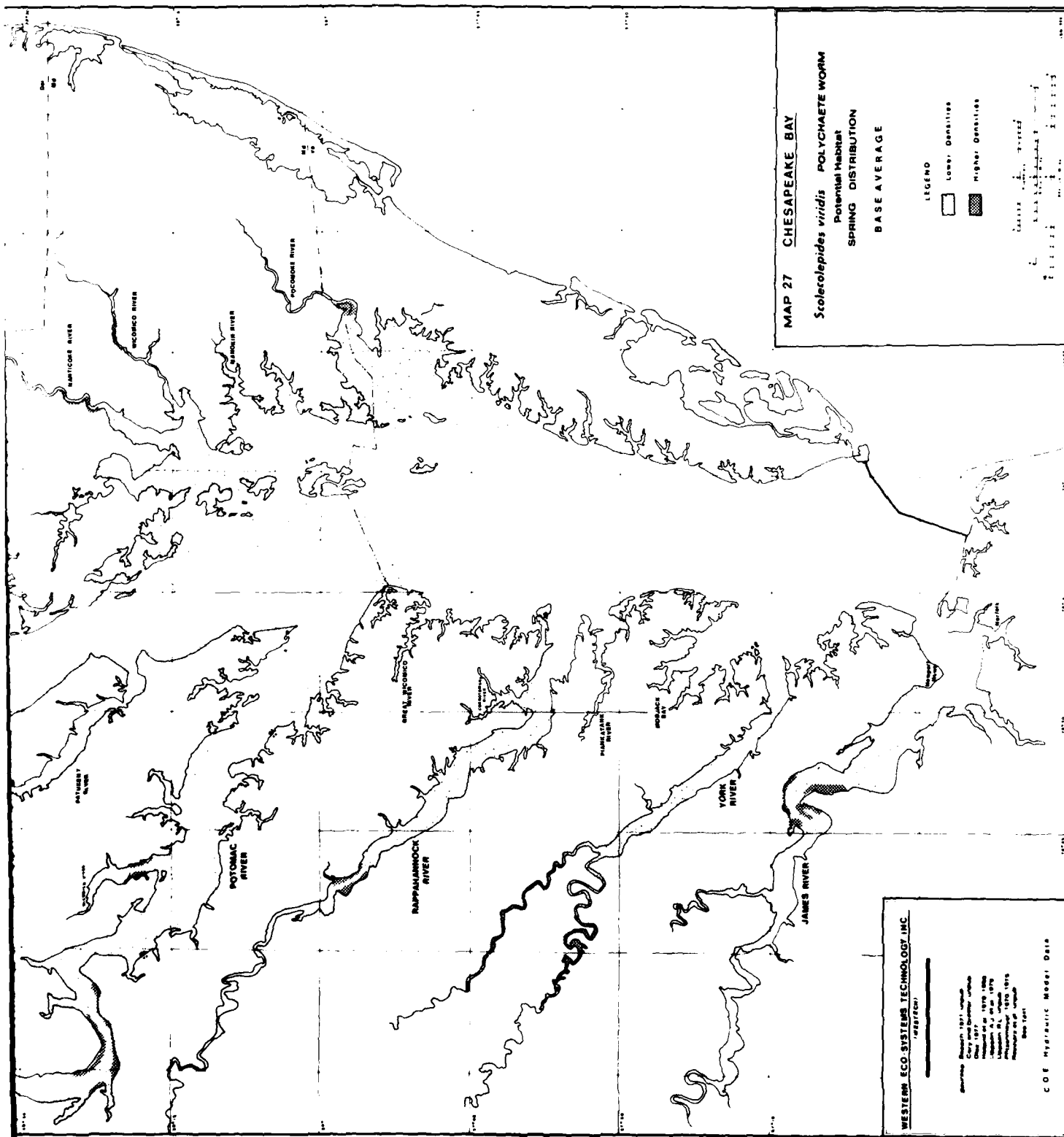


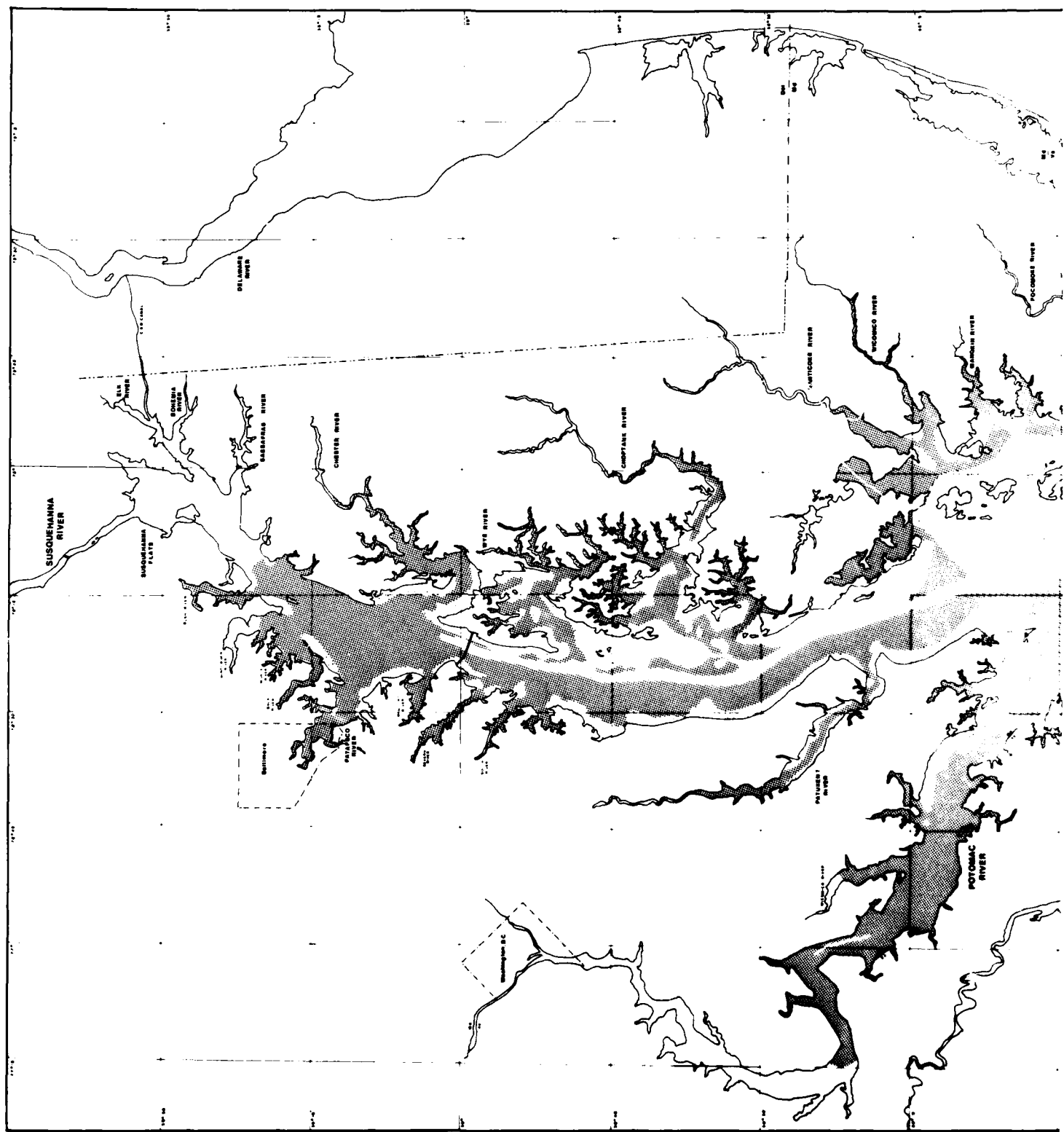




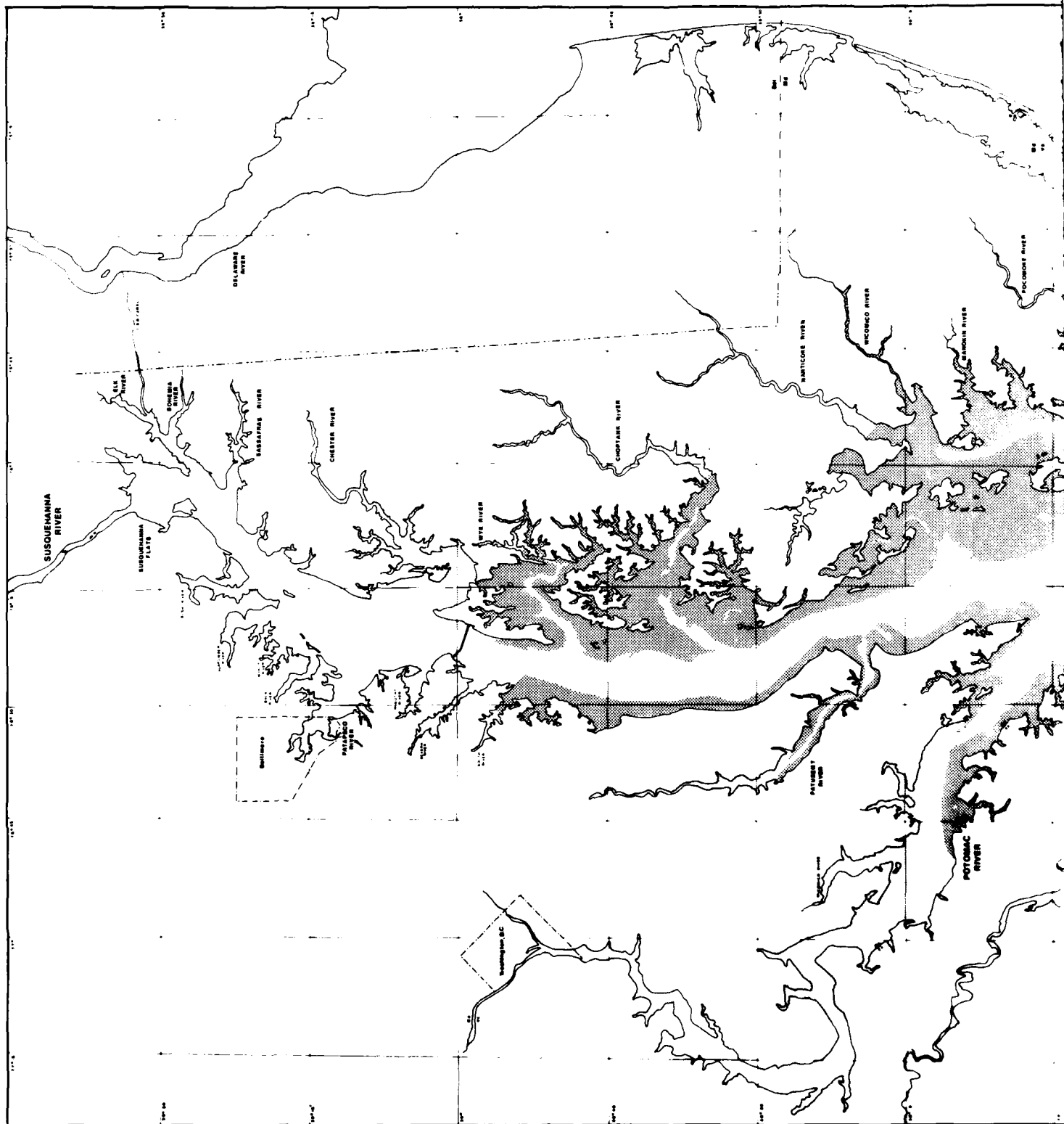




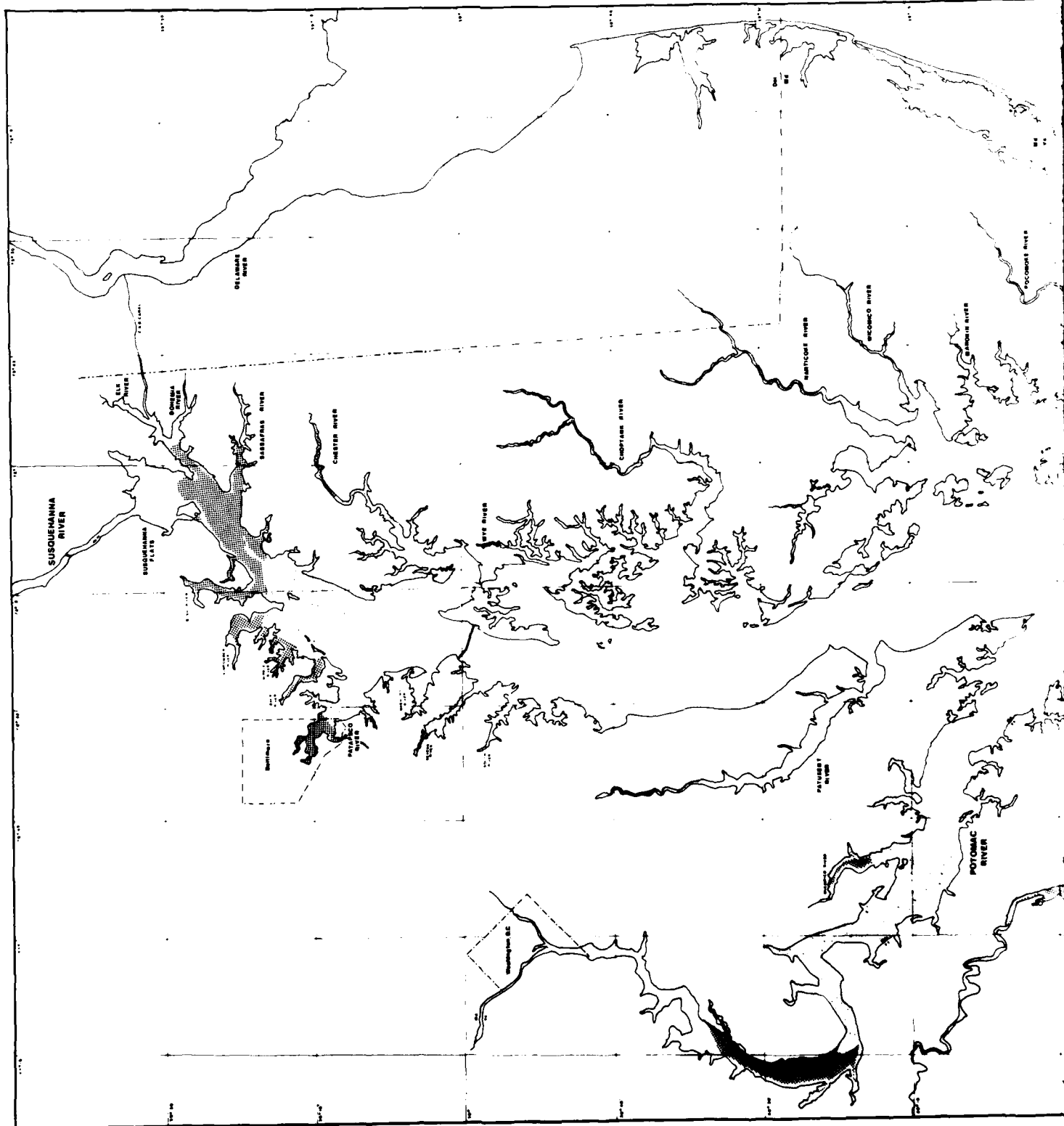








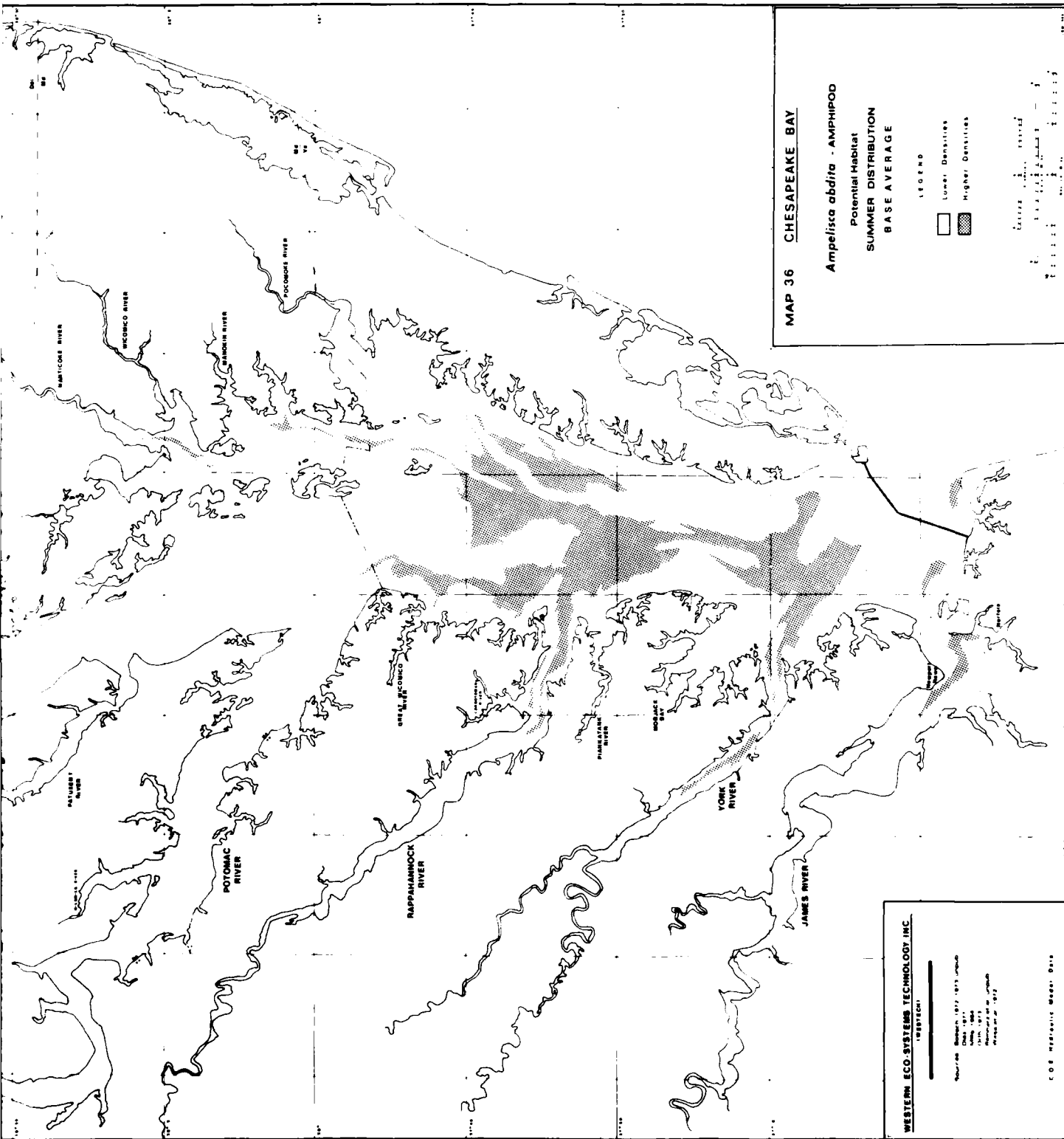












**MAP 36 CHESAPEAKE BAY**

*Ampelisca abdita* - AMPHIPOD  
 Potential Habitat  
 SUMMER DISTRIBUTION  
 BASE AVERAGE

**LEGEND**

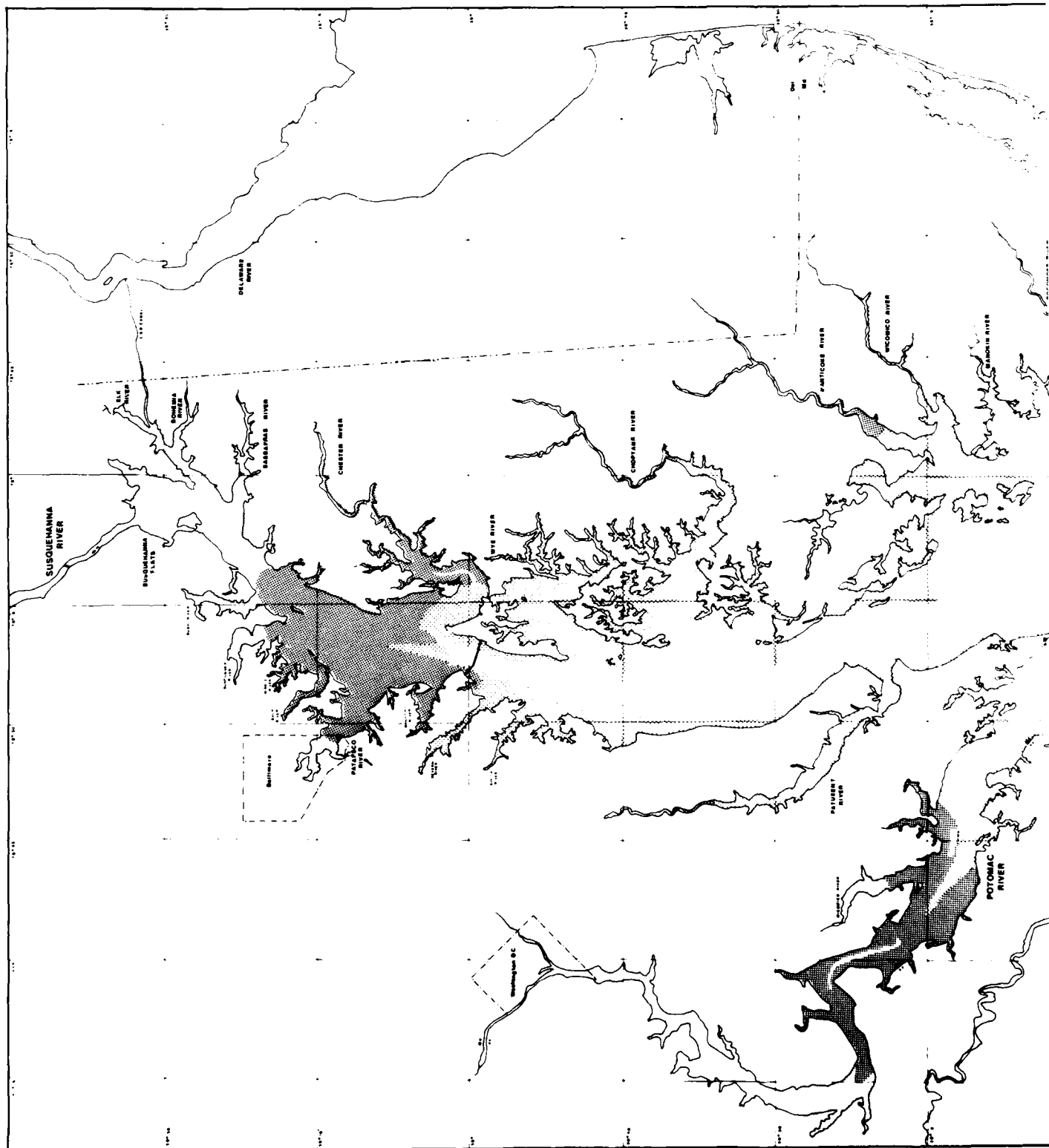
Lower Densities  
 Higher Densities

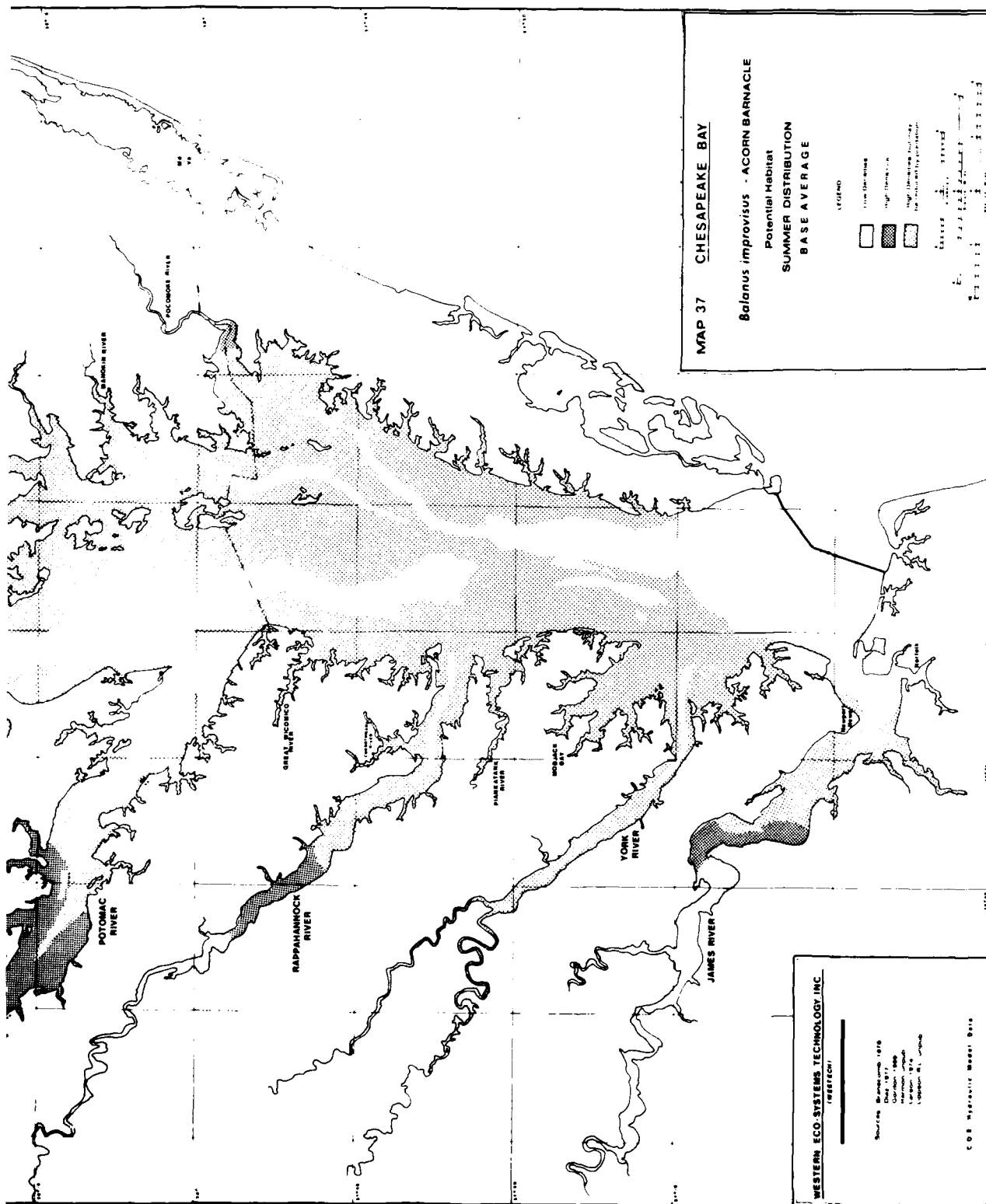
Scale: 1:100,000  
 0 1 2 3 4 5 6 7 8 9 10 Miles

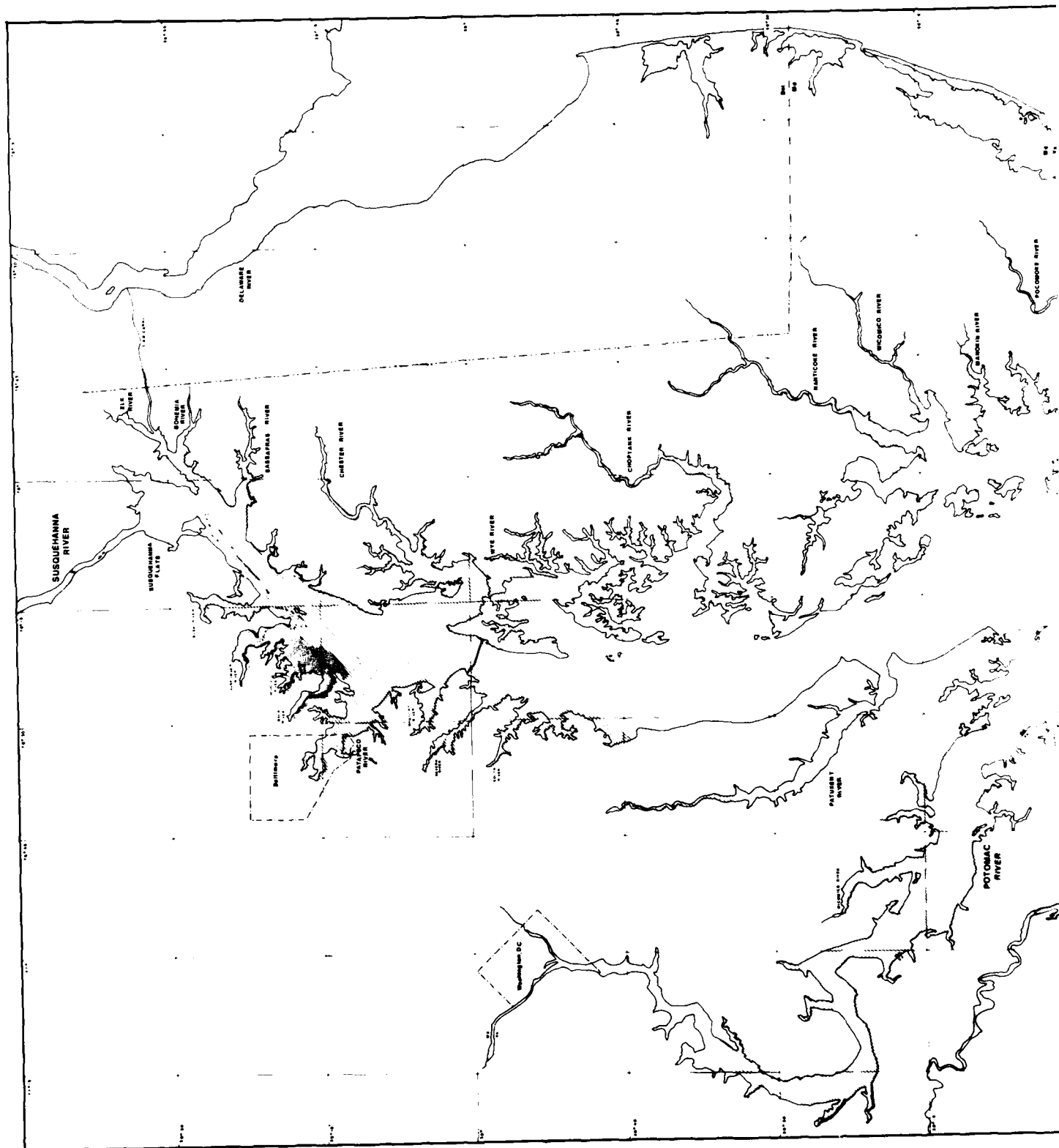
**WESTERN ECO-SYSTEMS TECHNOLOGY, INC.**  
 (continued)

Source: Benthic, 1977; 1978; 1979  
 Data: 1980  
 Date: 1981  
 Project: 1981

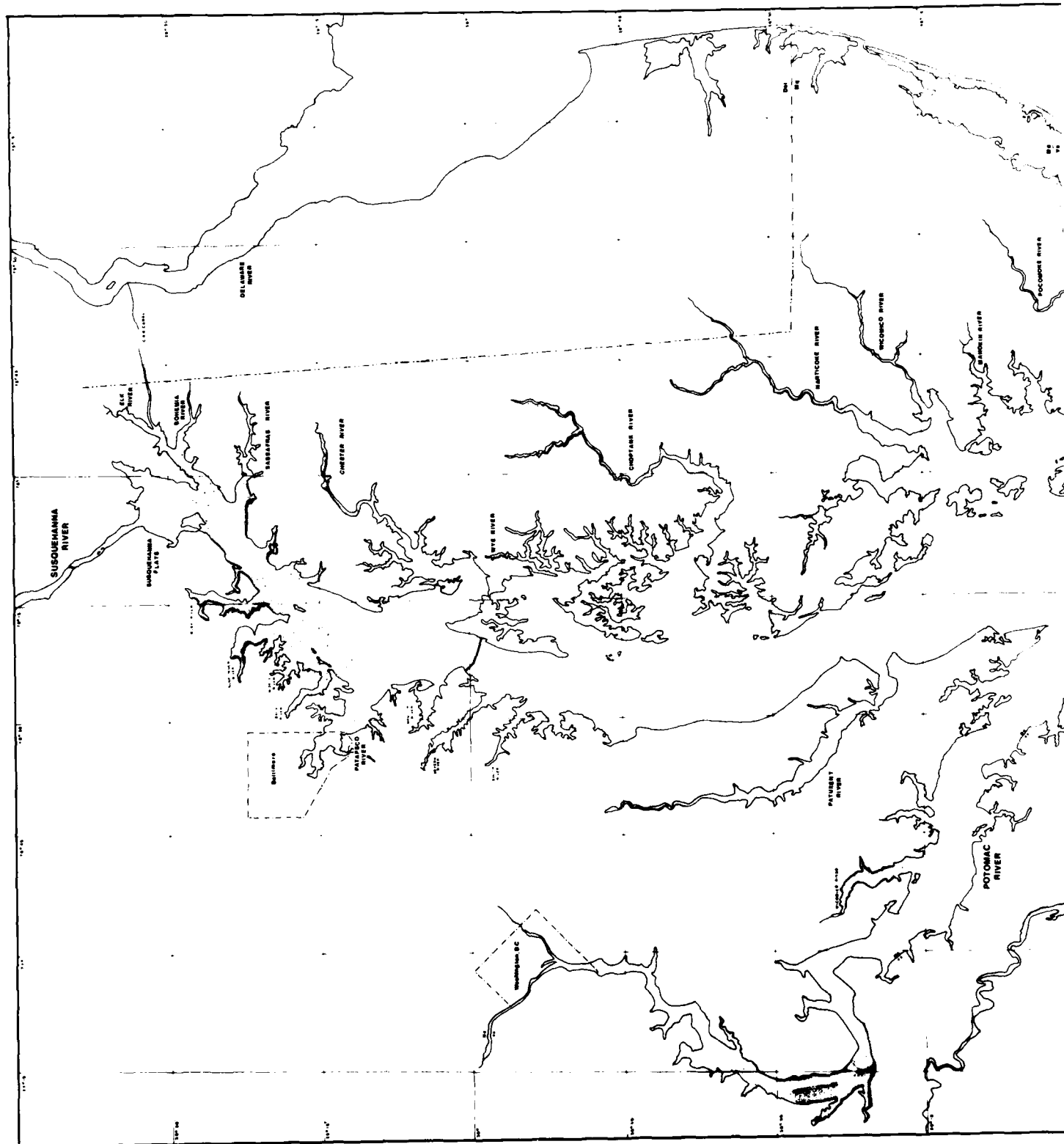
C O S WESTERN MEDIA: Data

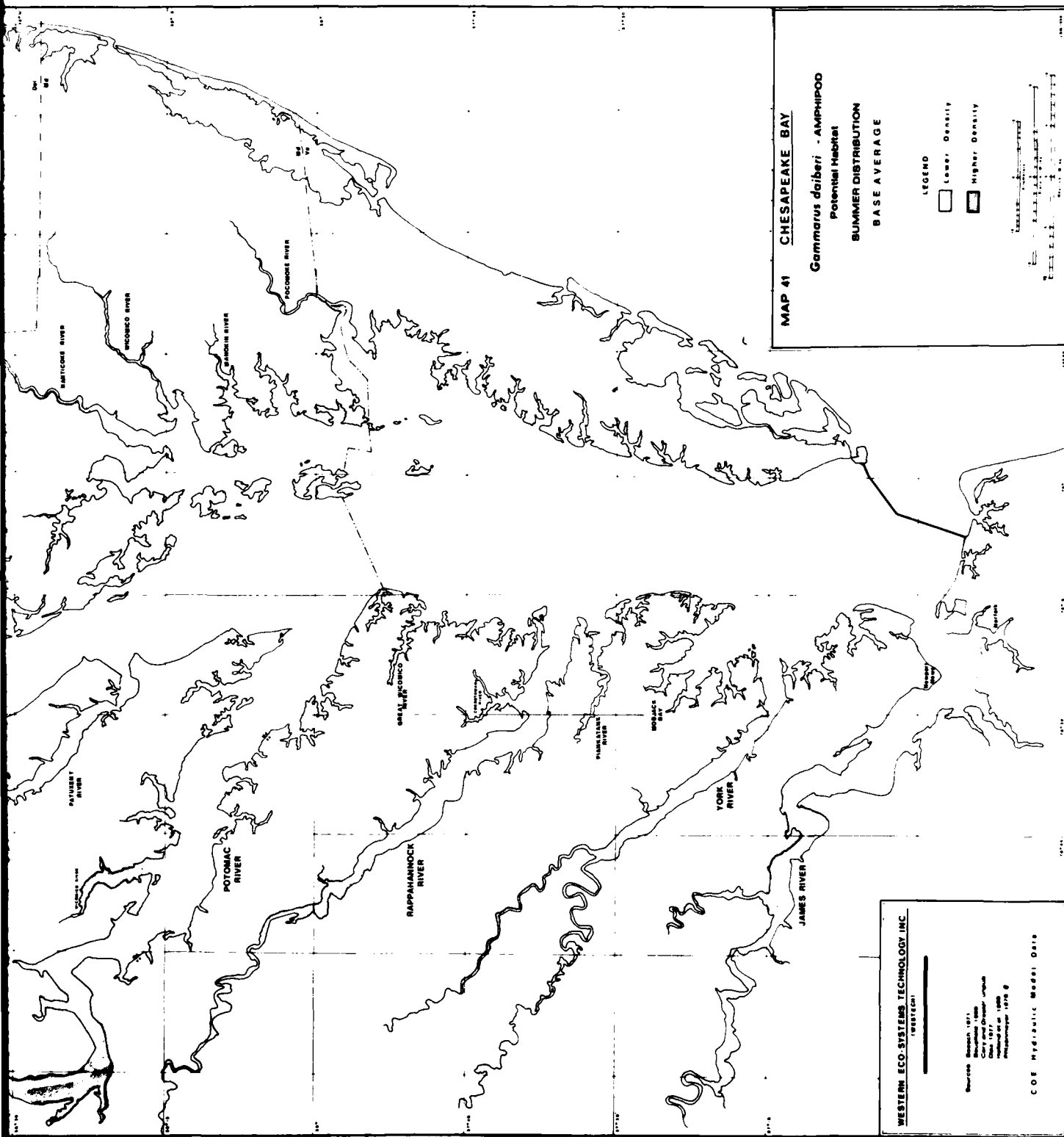


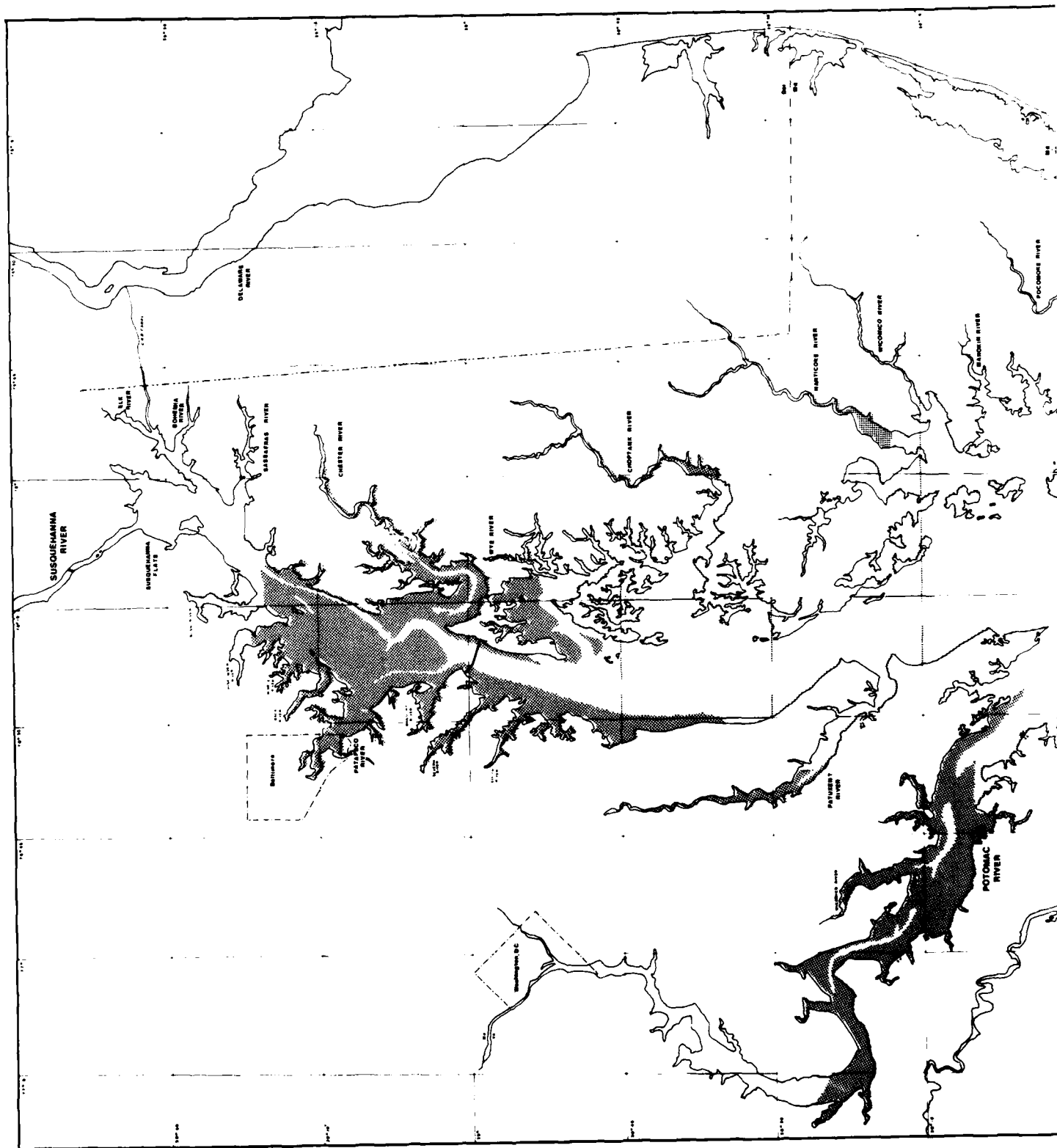




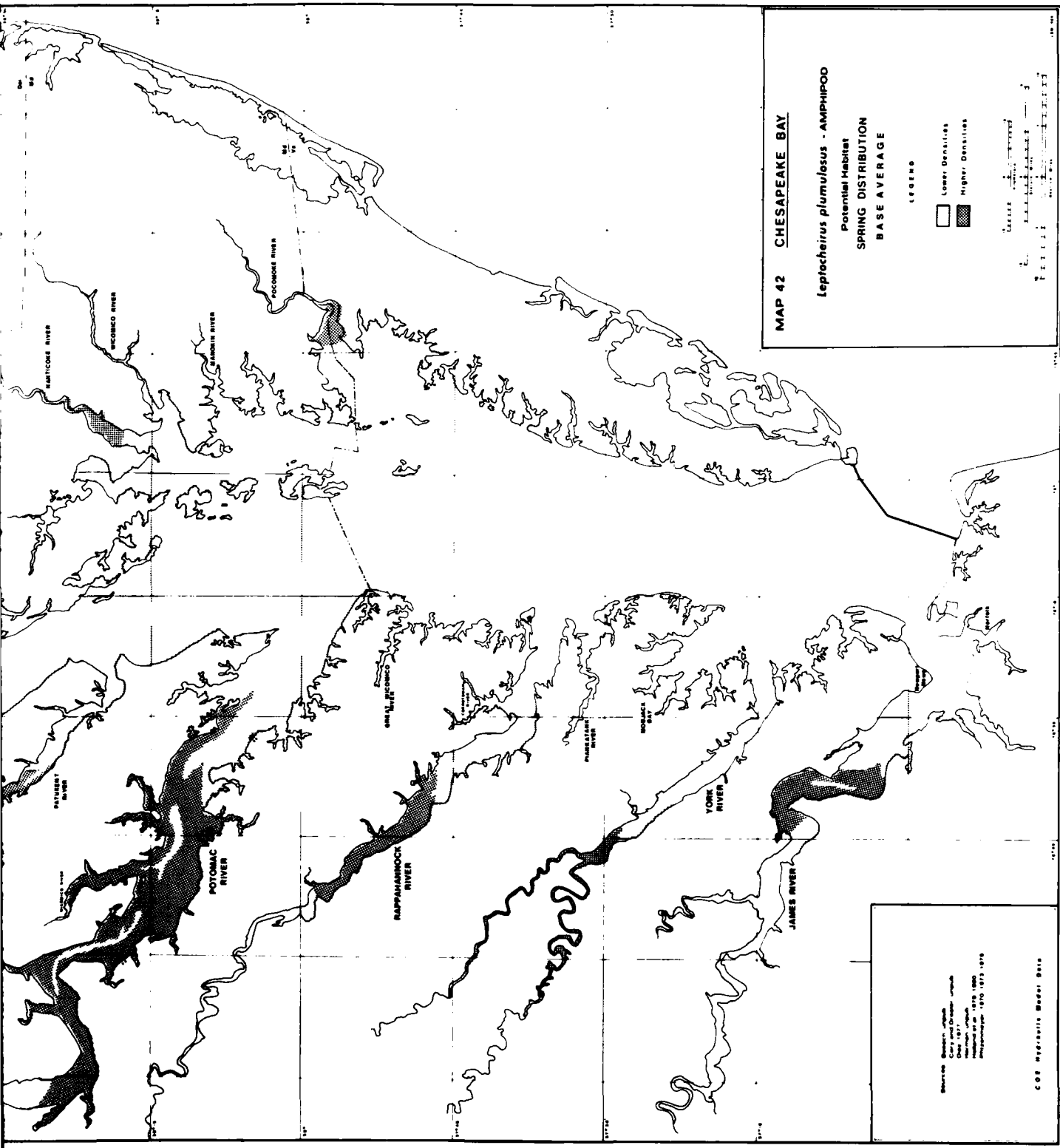


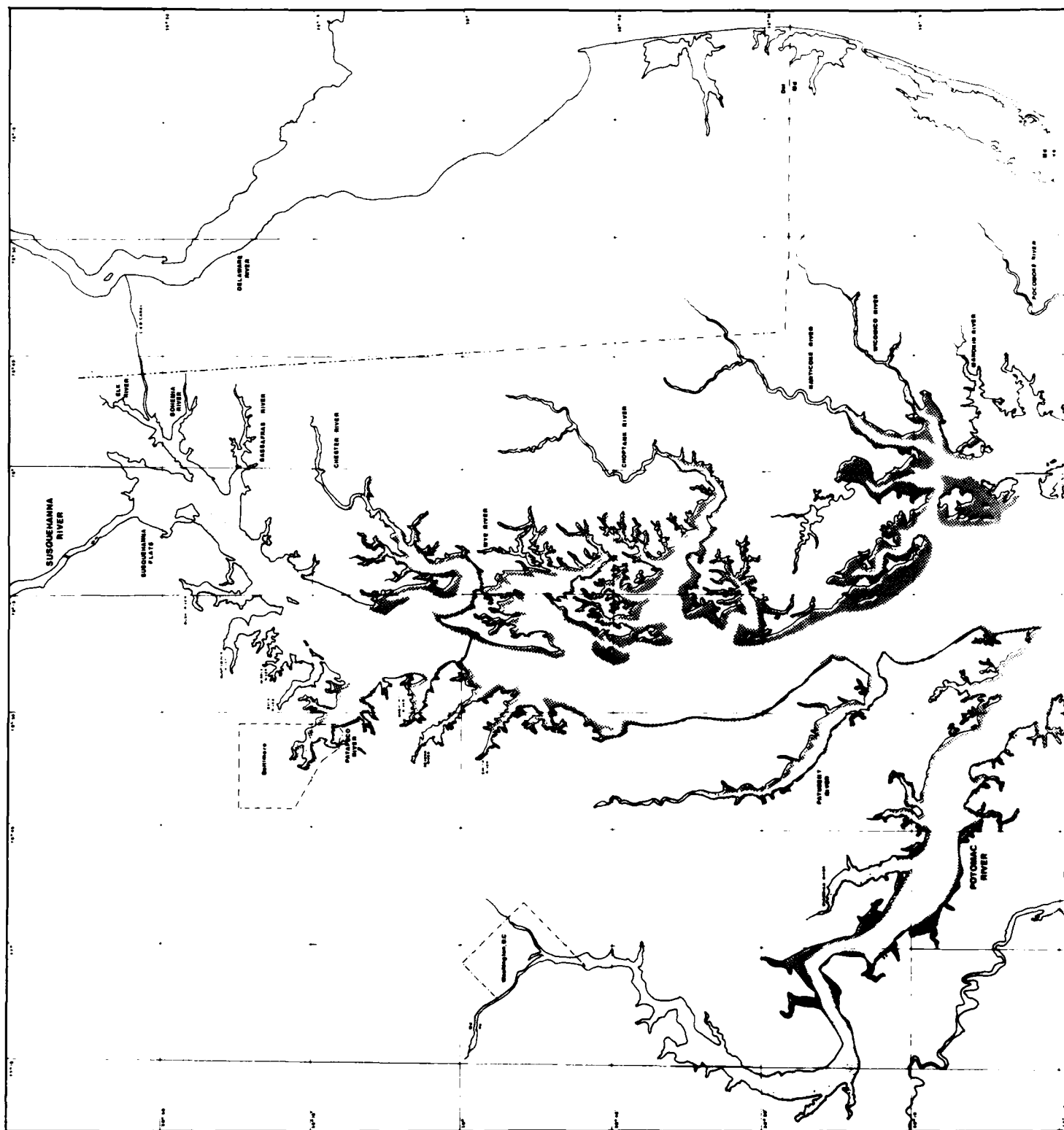




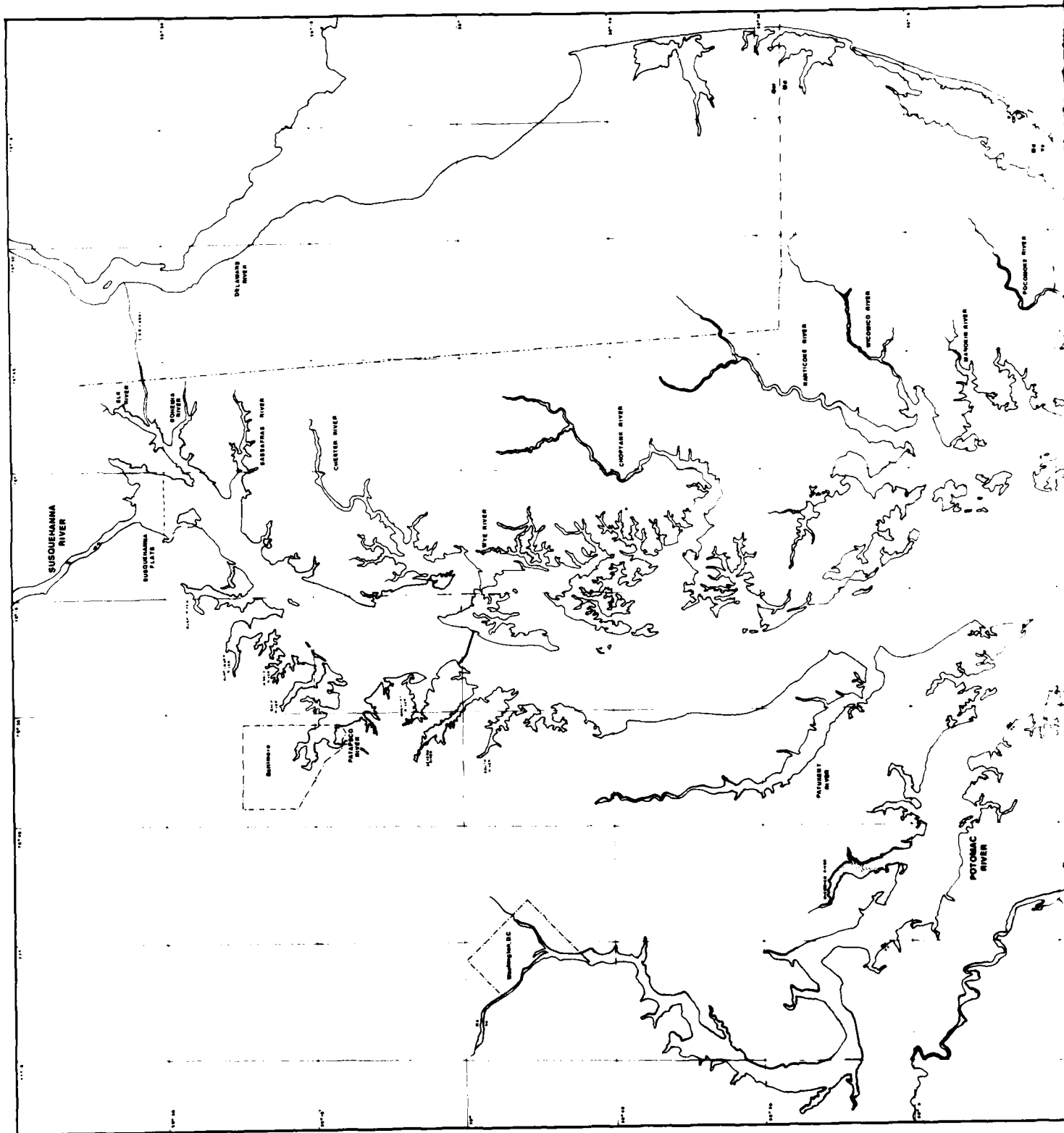




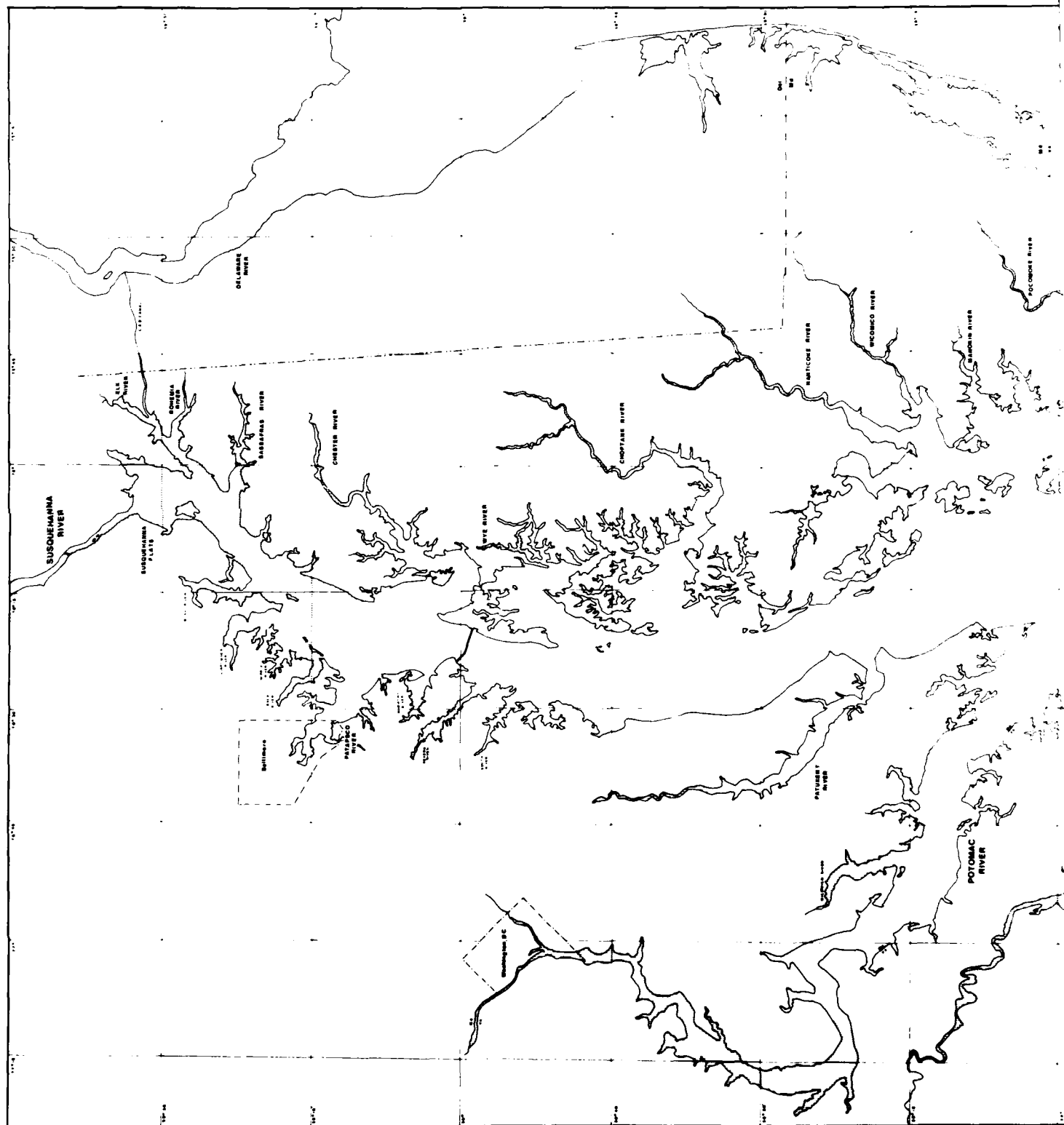


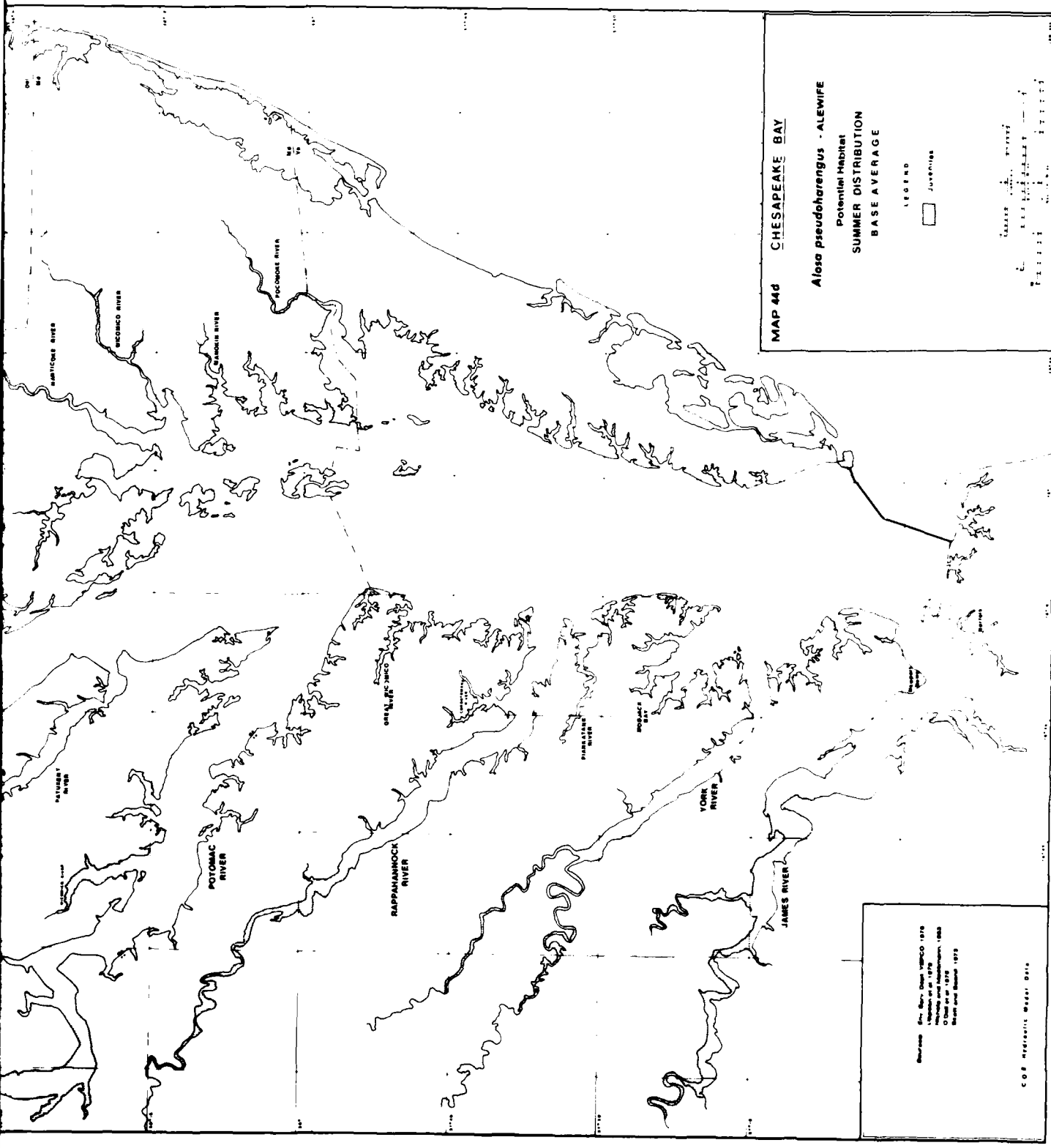


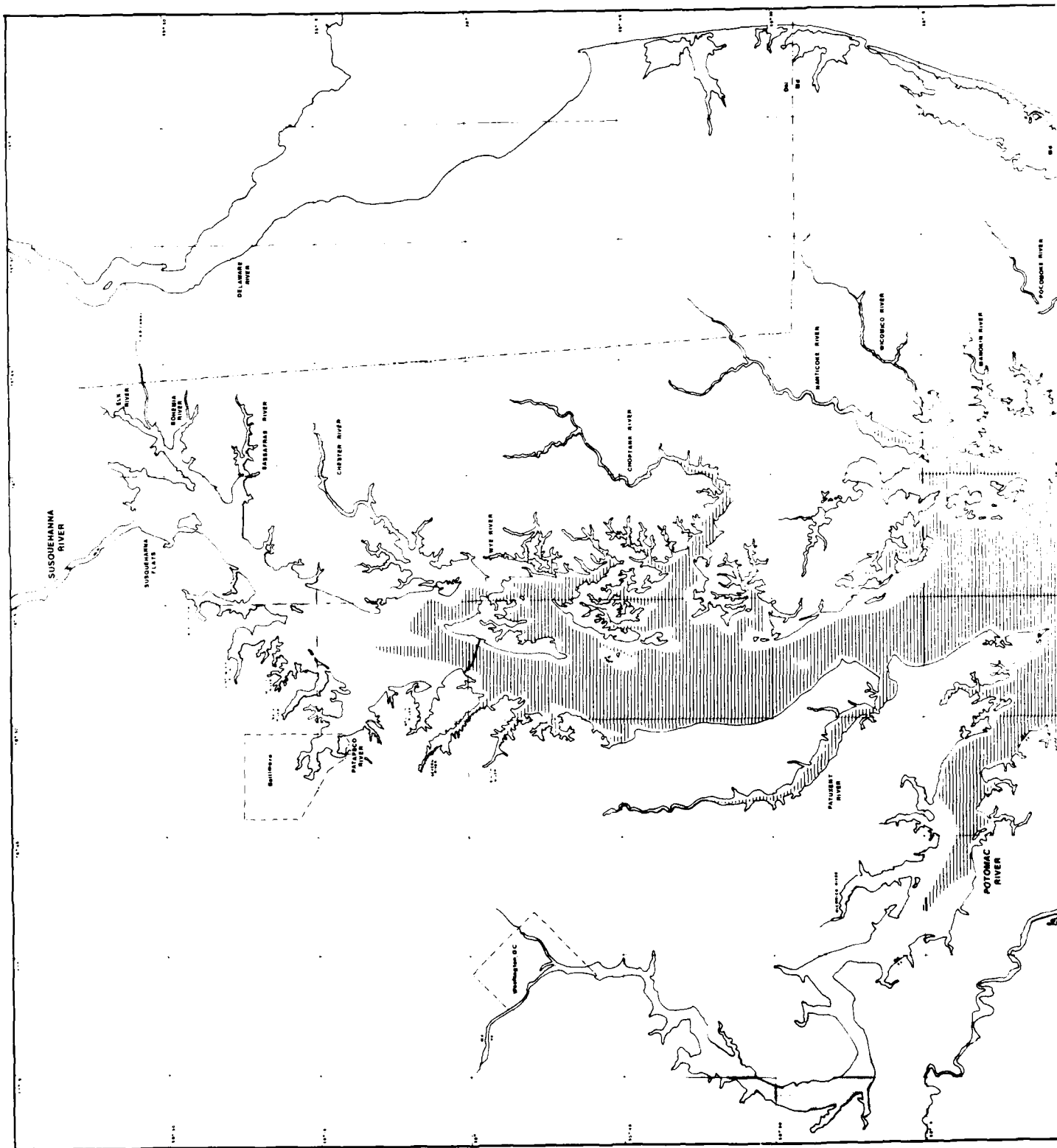






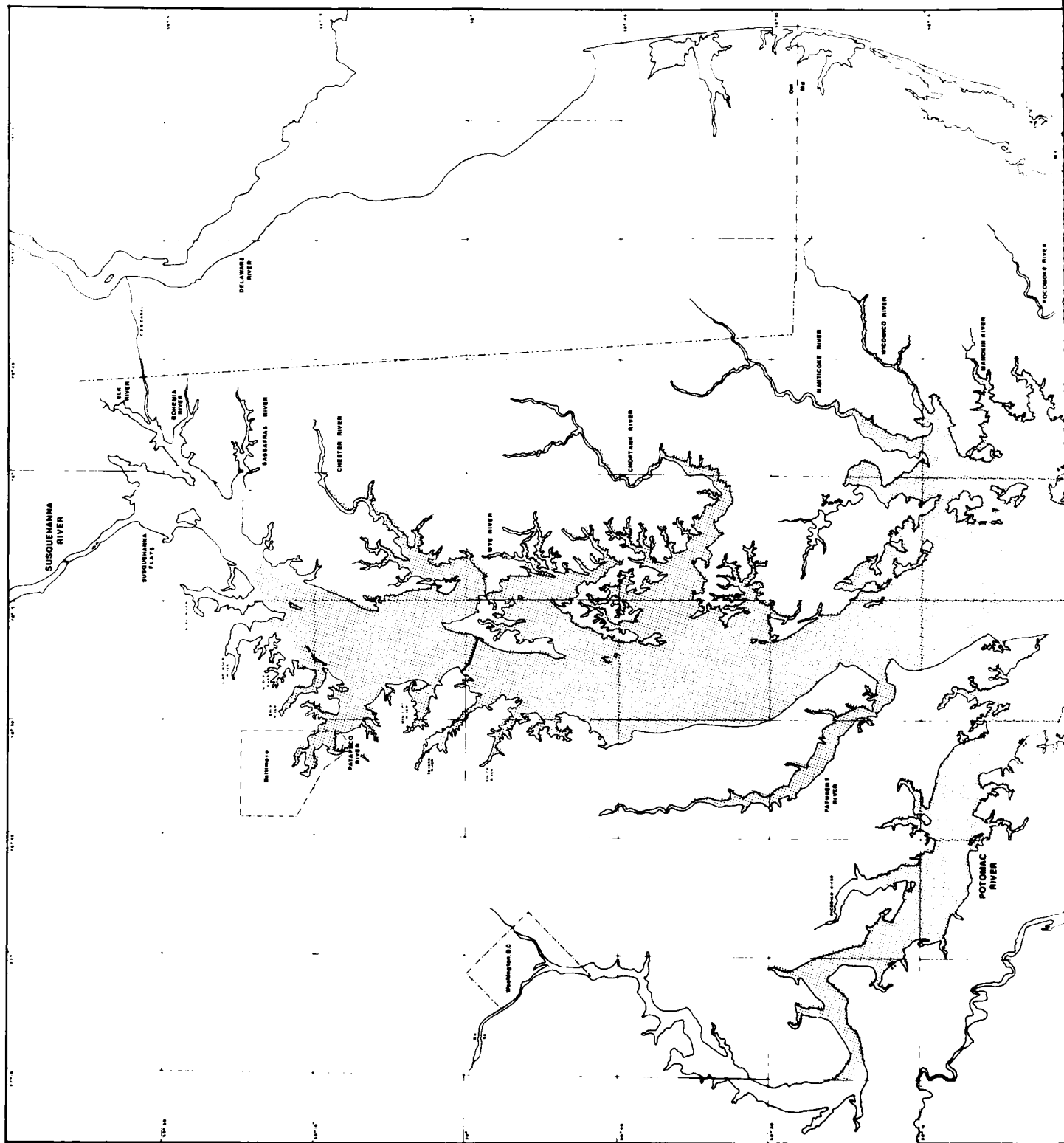


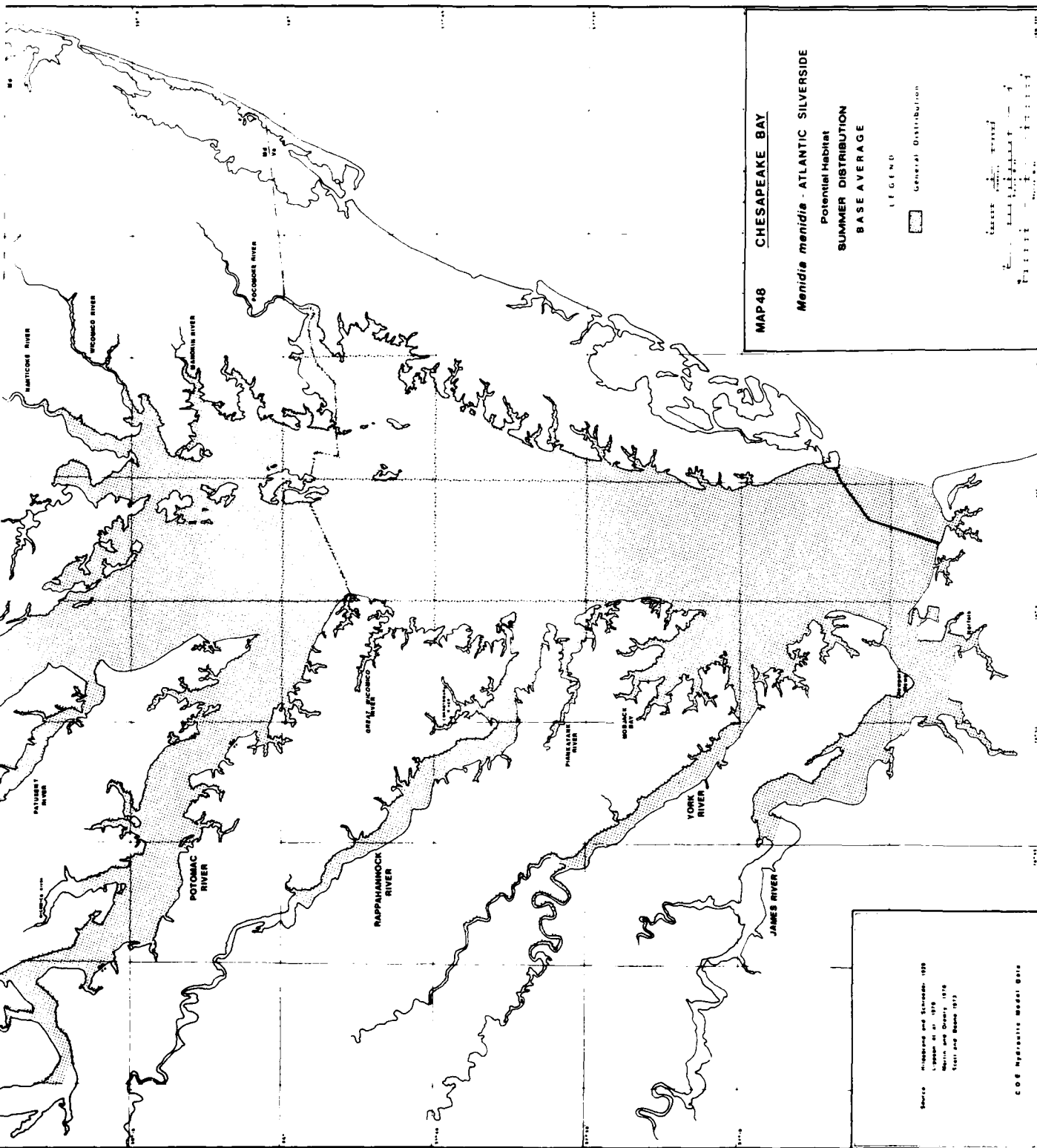


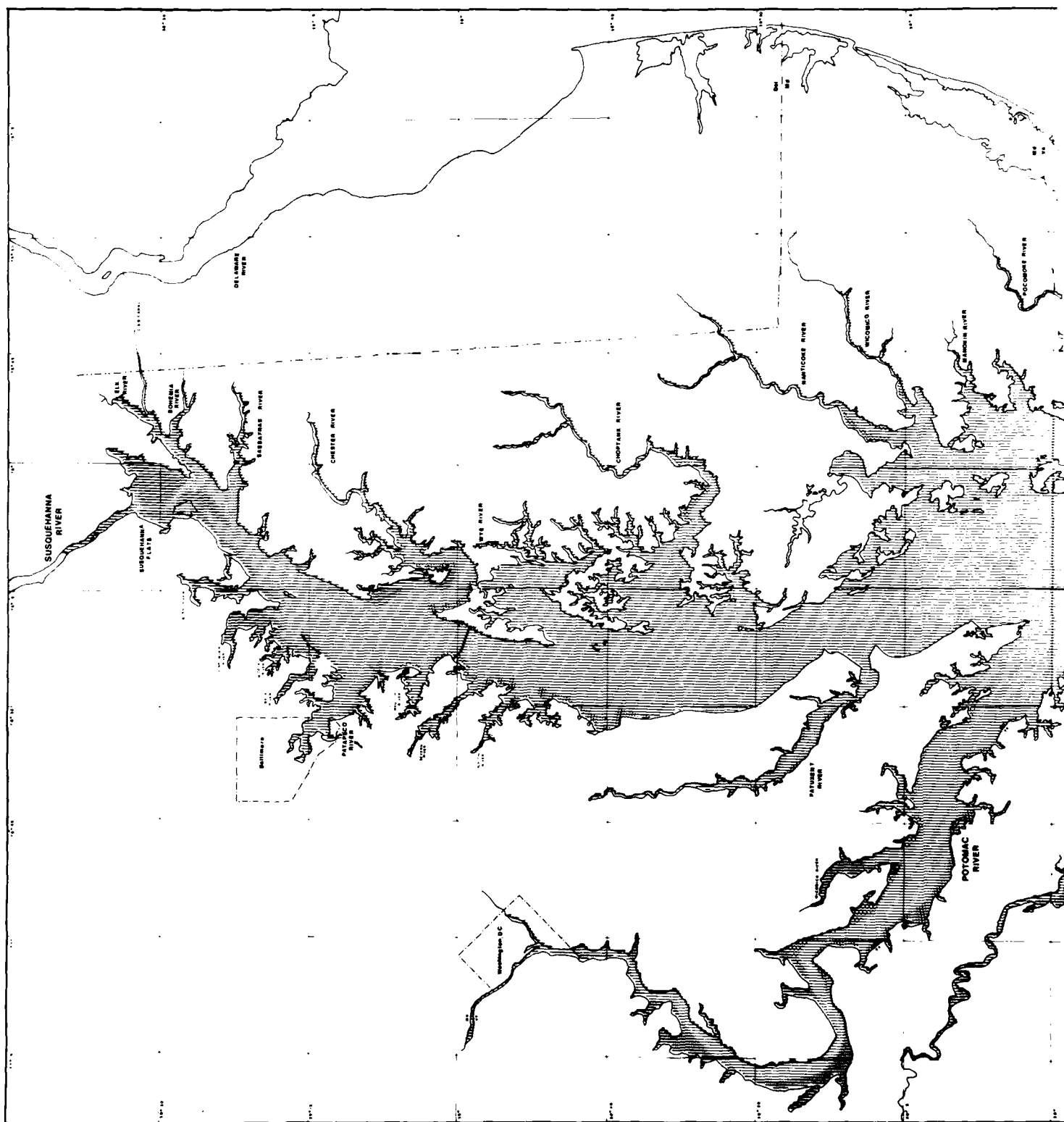




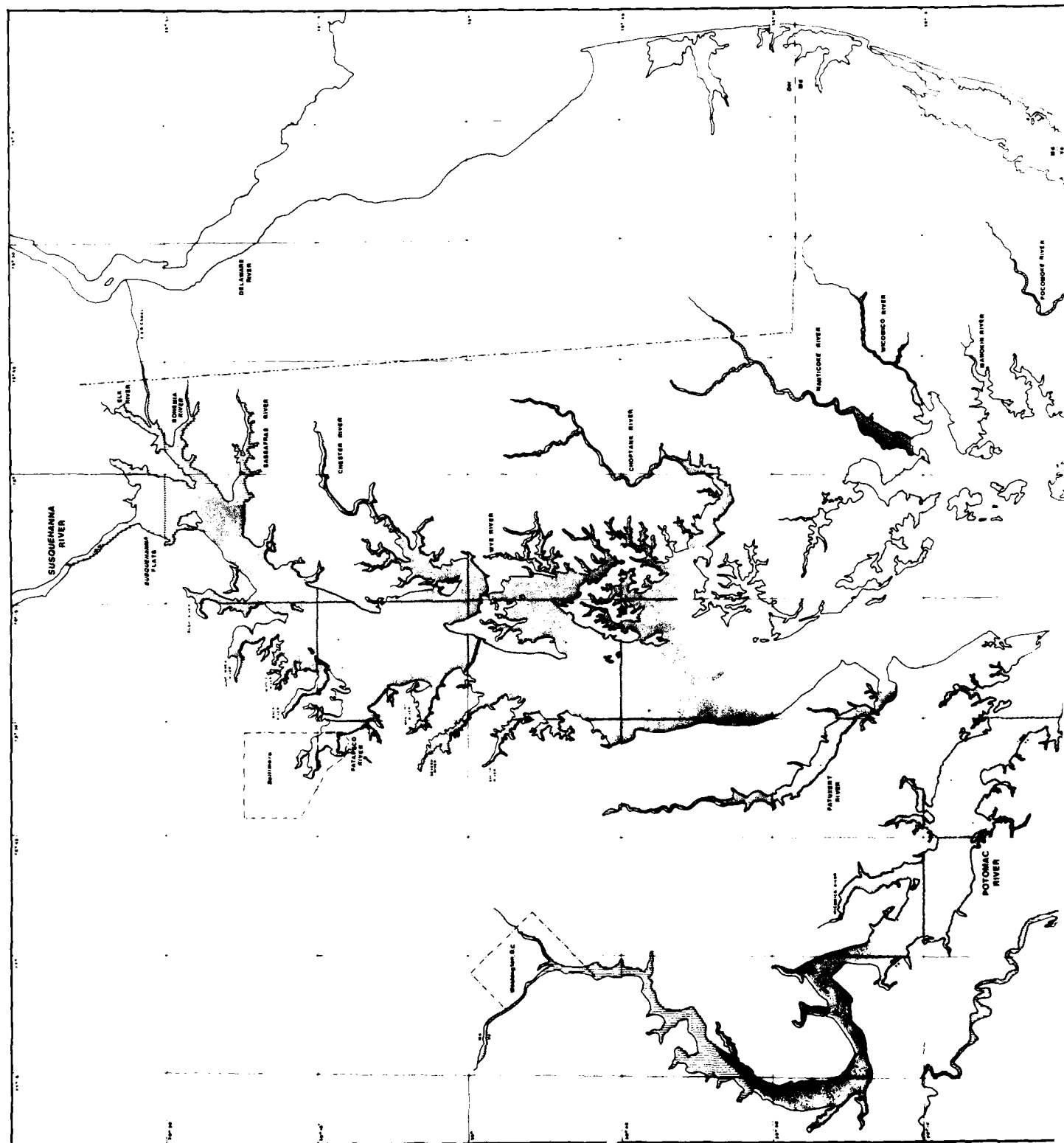


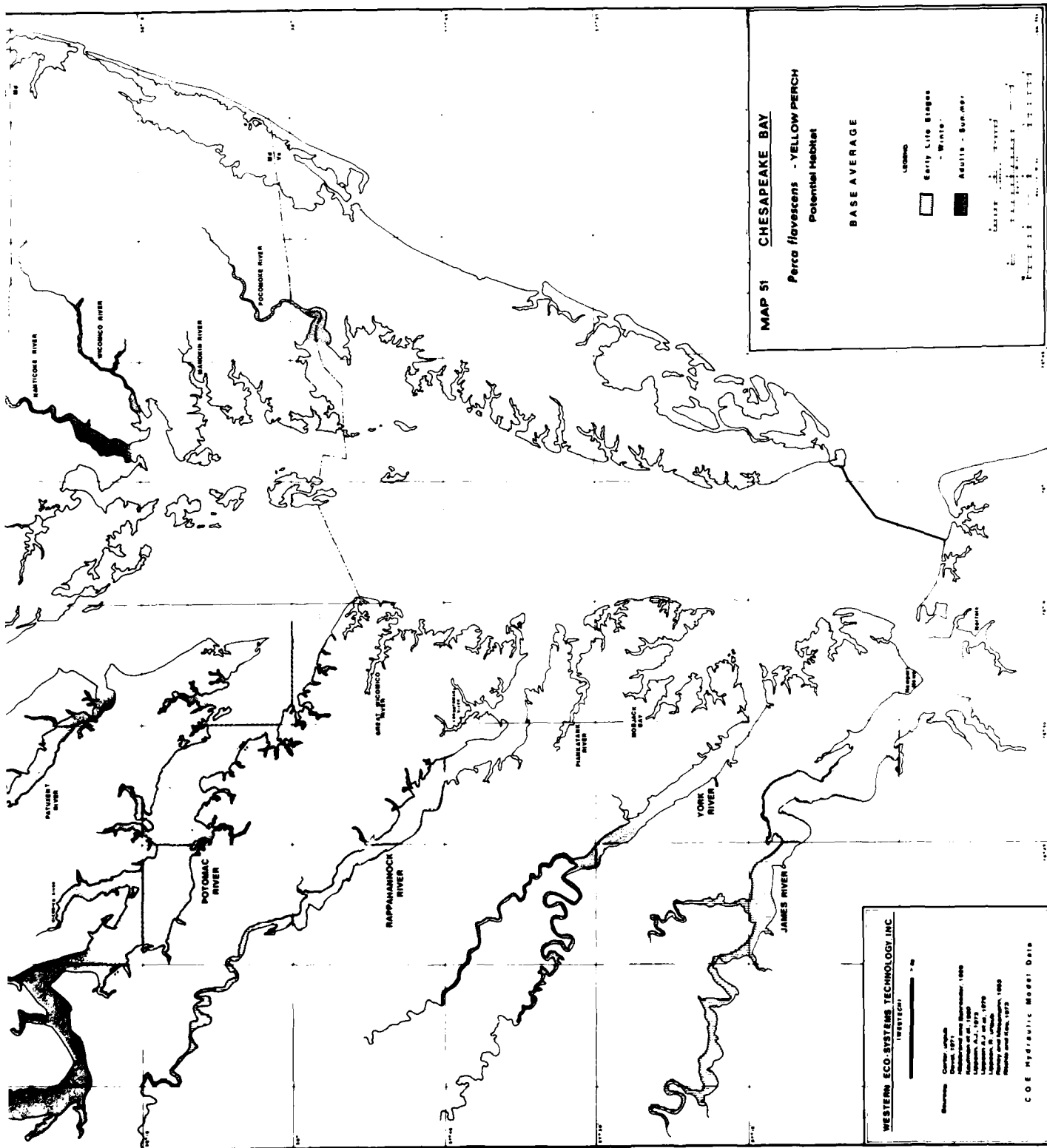


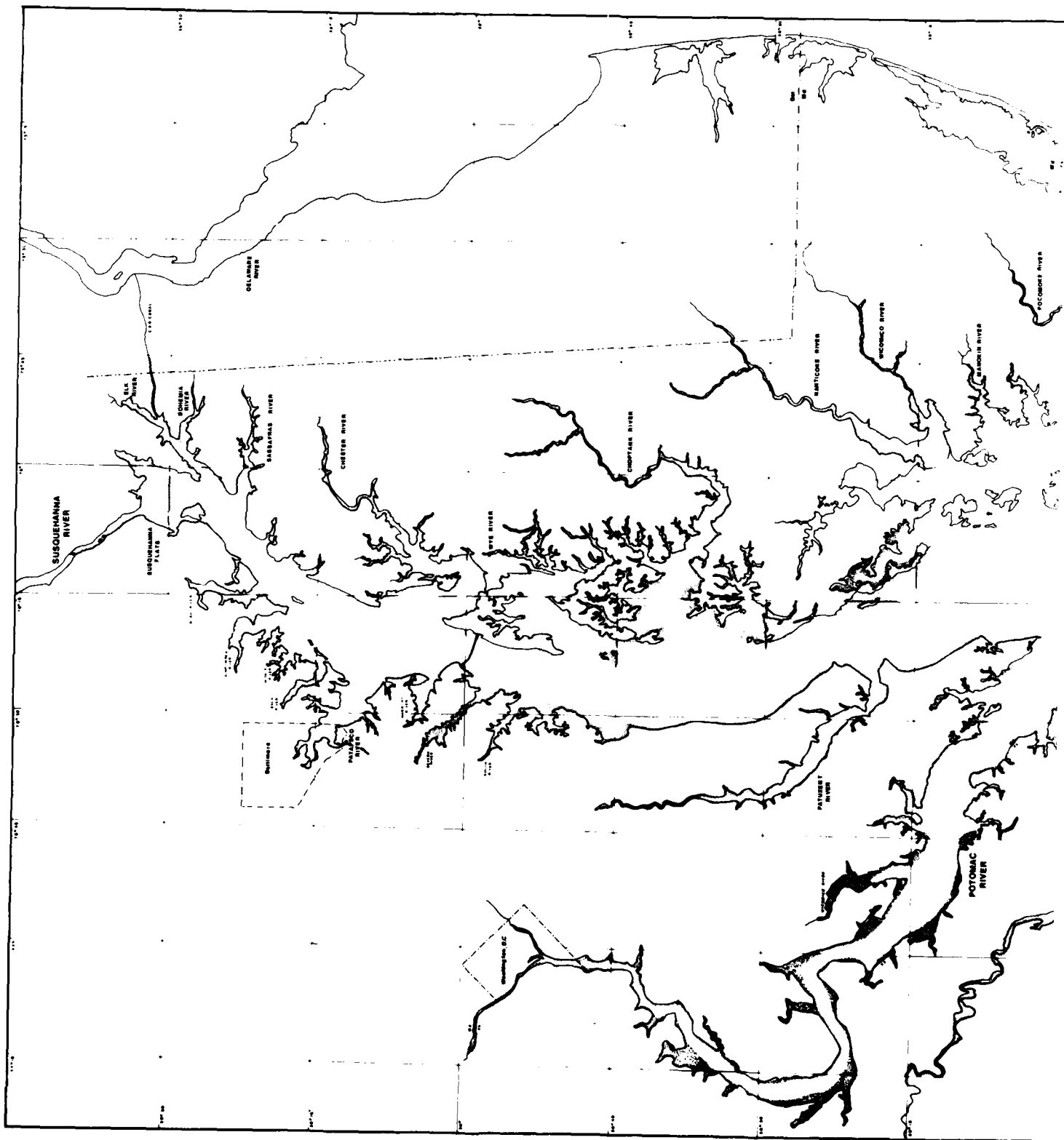




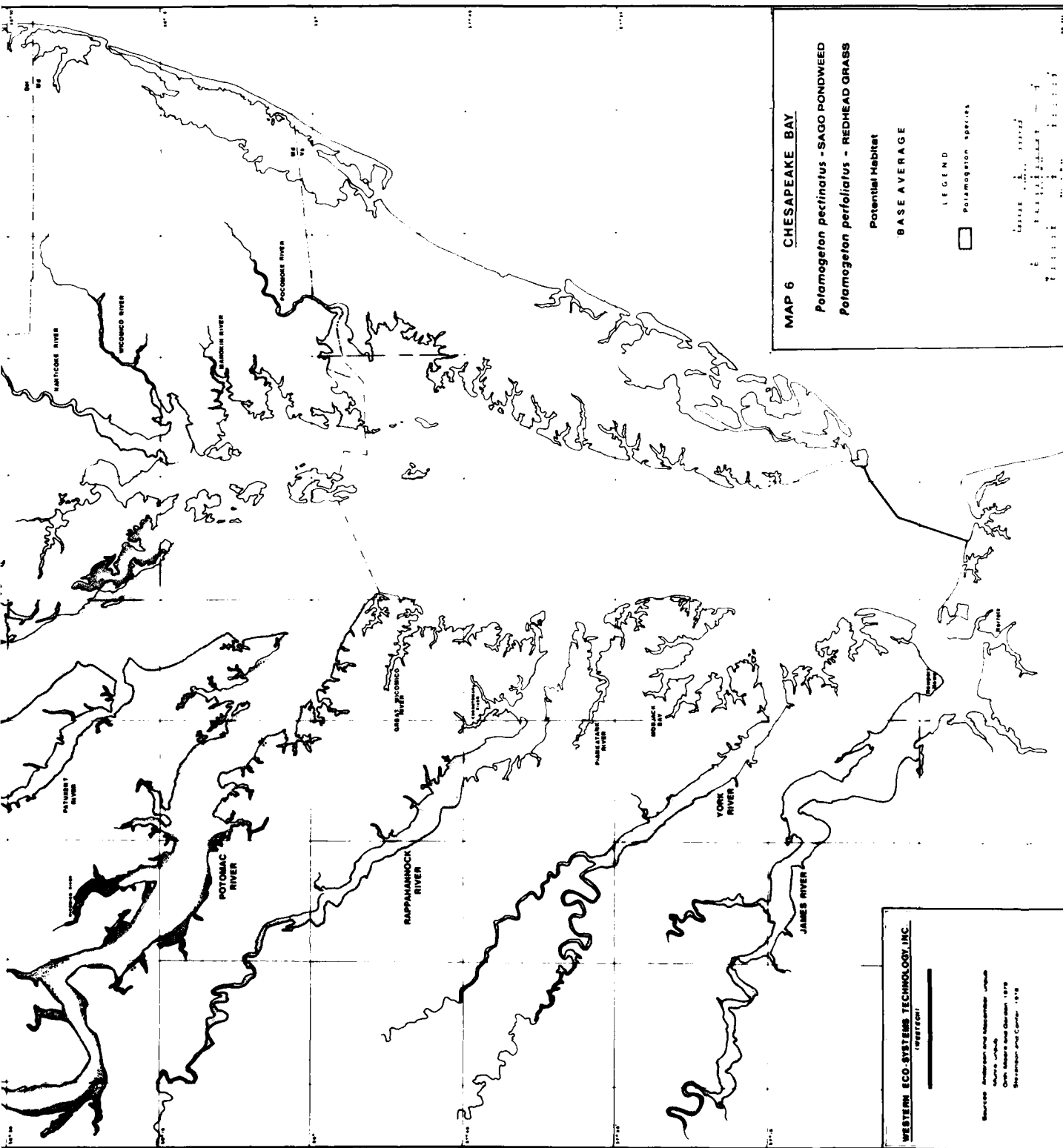


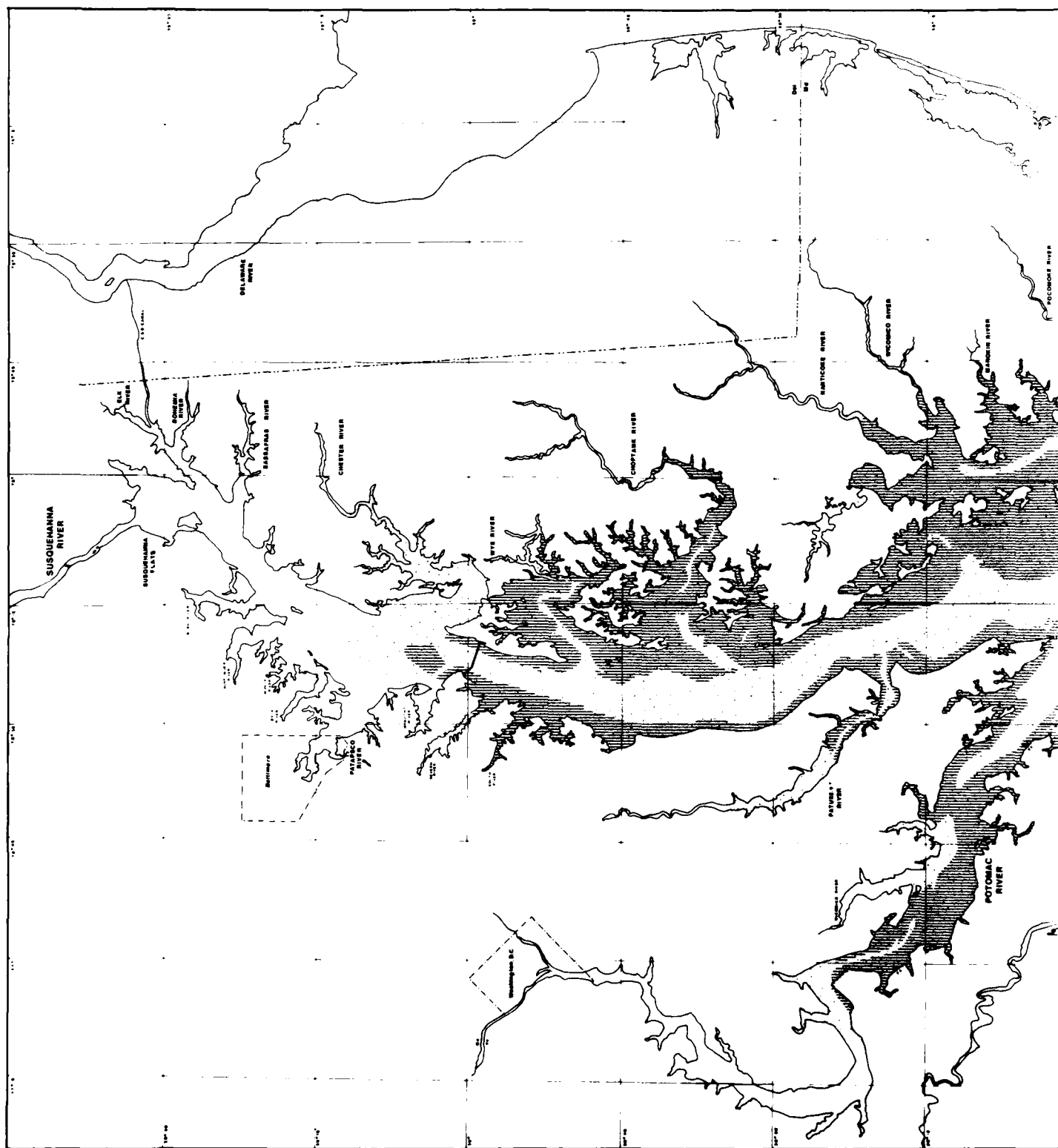


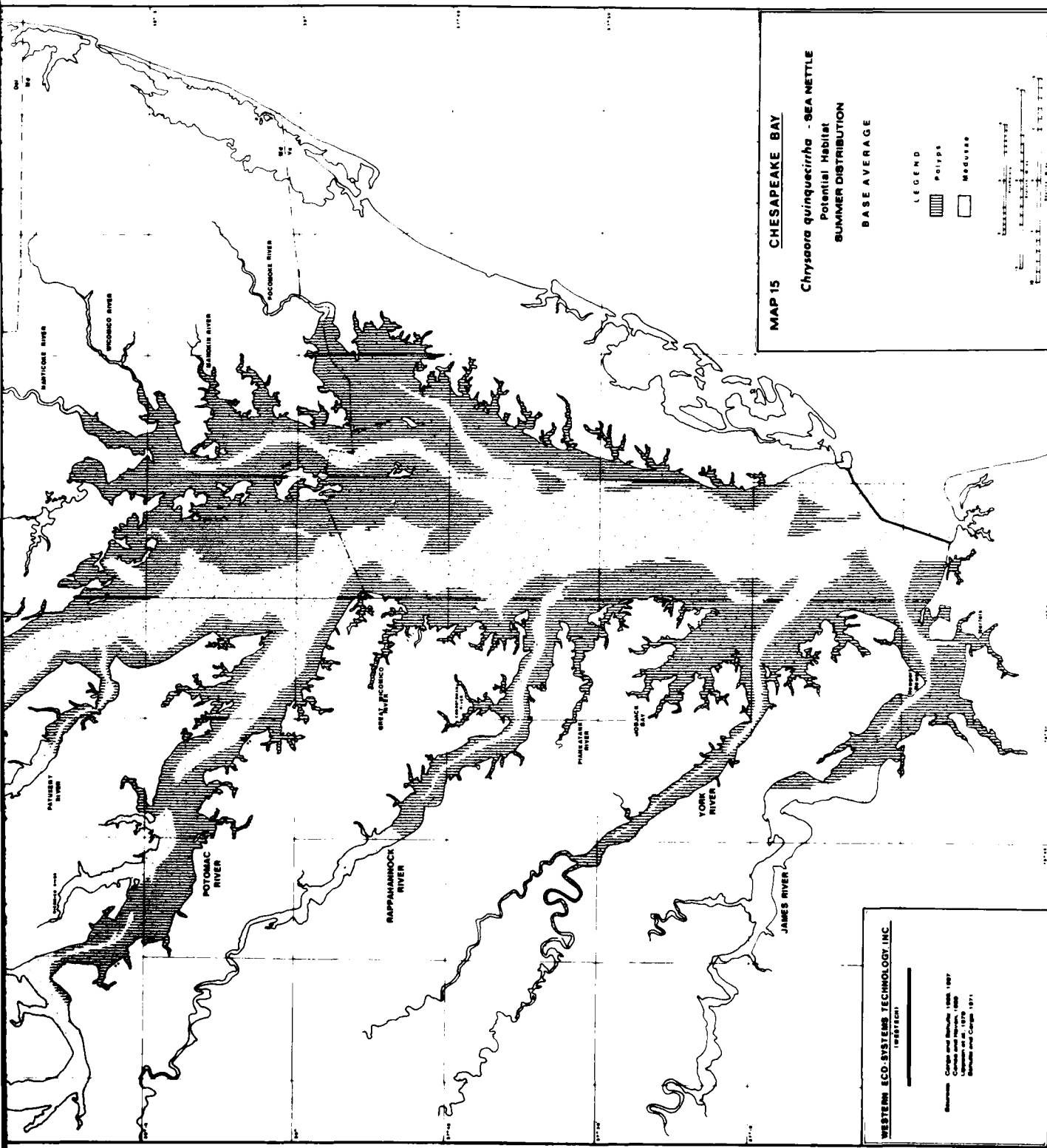


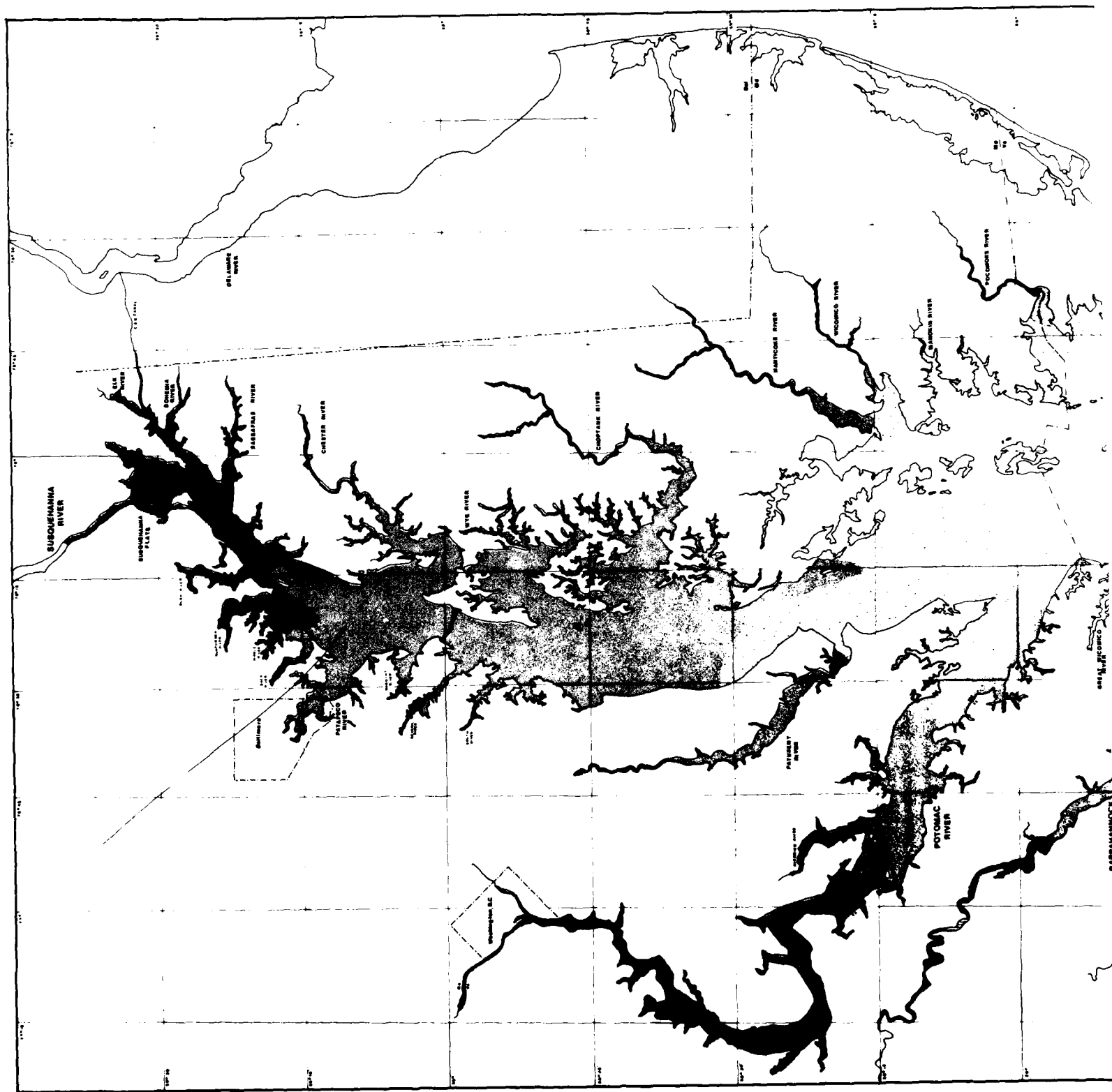


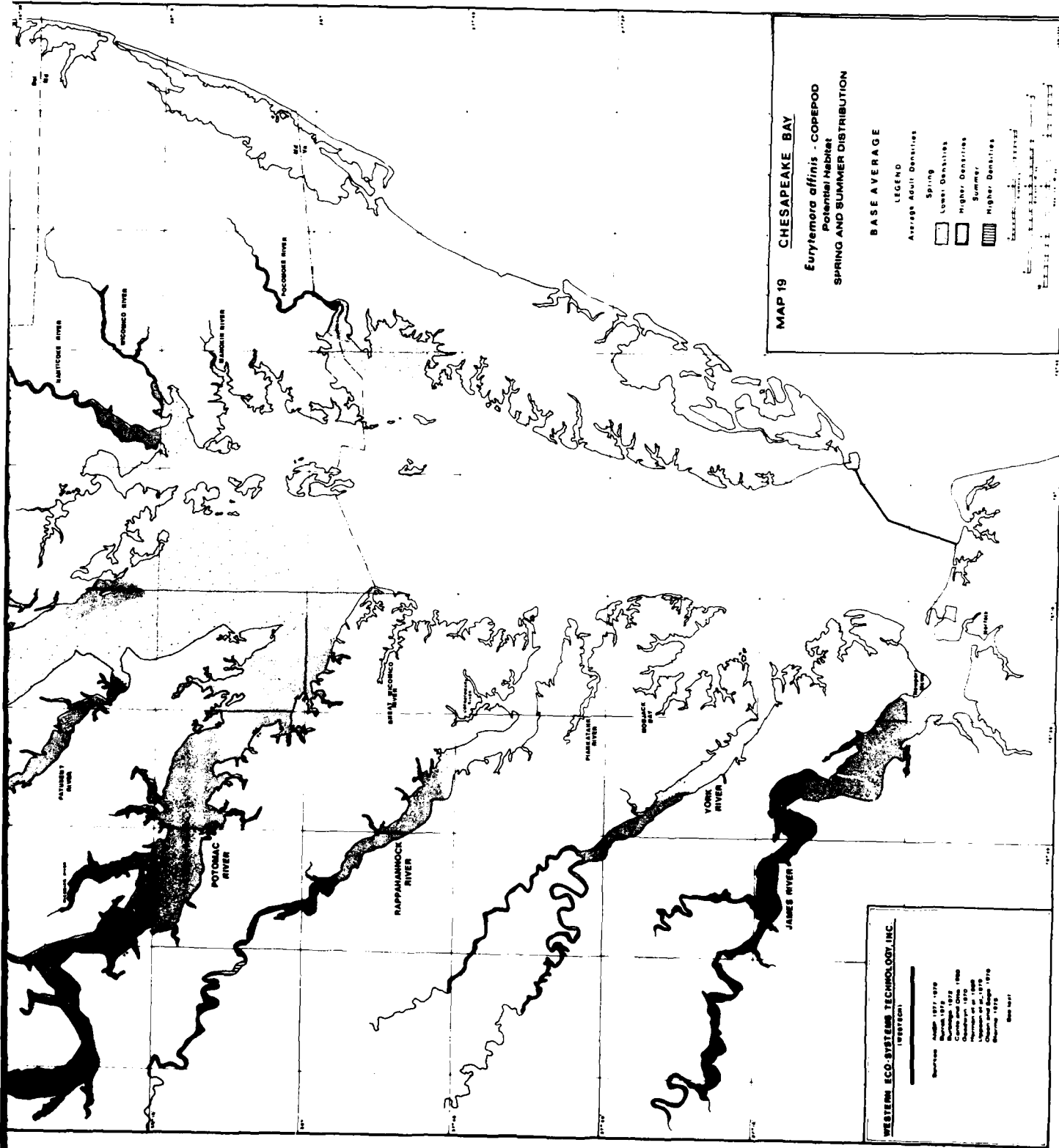


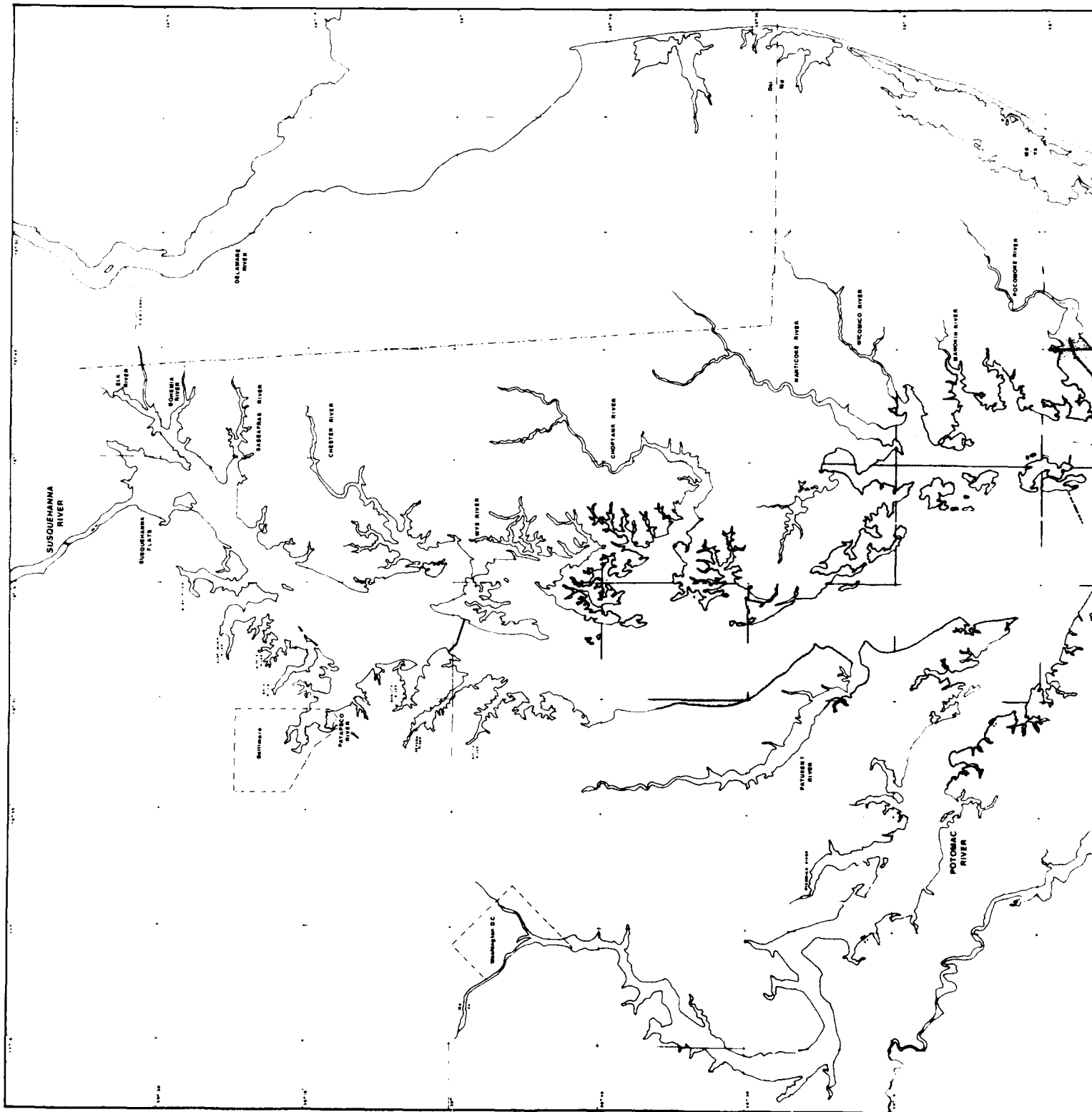












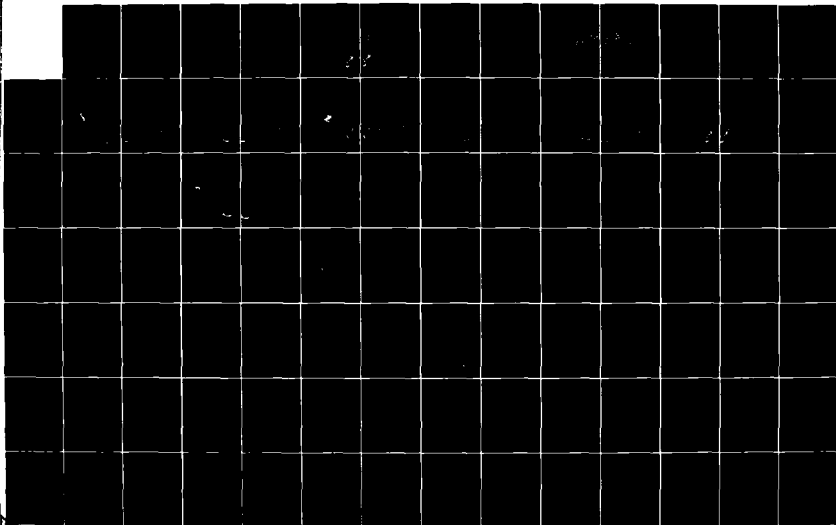
AD-A125 154

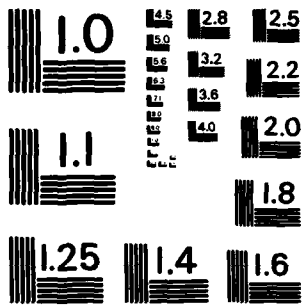
CHESAPEAKE BAY LOW FRESHWATER INFLOW STUDY PHASE II  
BIOTA ASSESSMENT MAP... (U) WESTERN ECO-SYSTEMS  
TECHNOLOGY INC BOTHELL WA G B MACKIERNAN ET AL. MAY 82  
DACW31-79-C-0056

UNCLASSIFIED

F/G 6/6

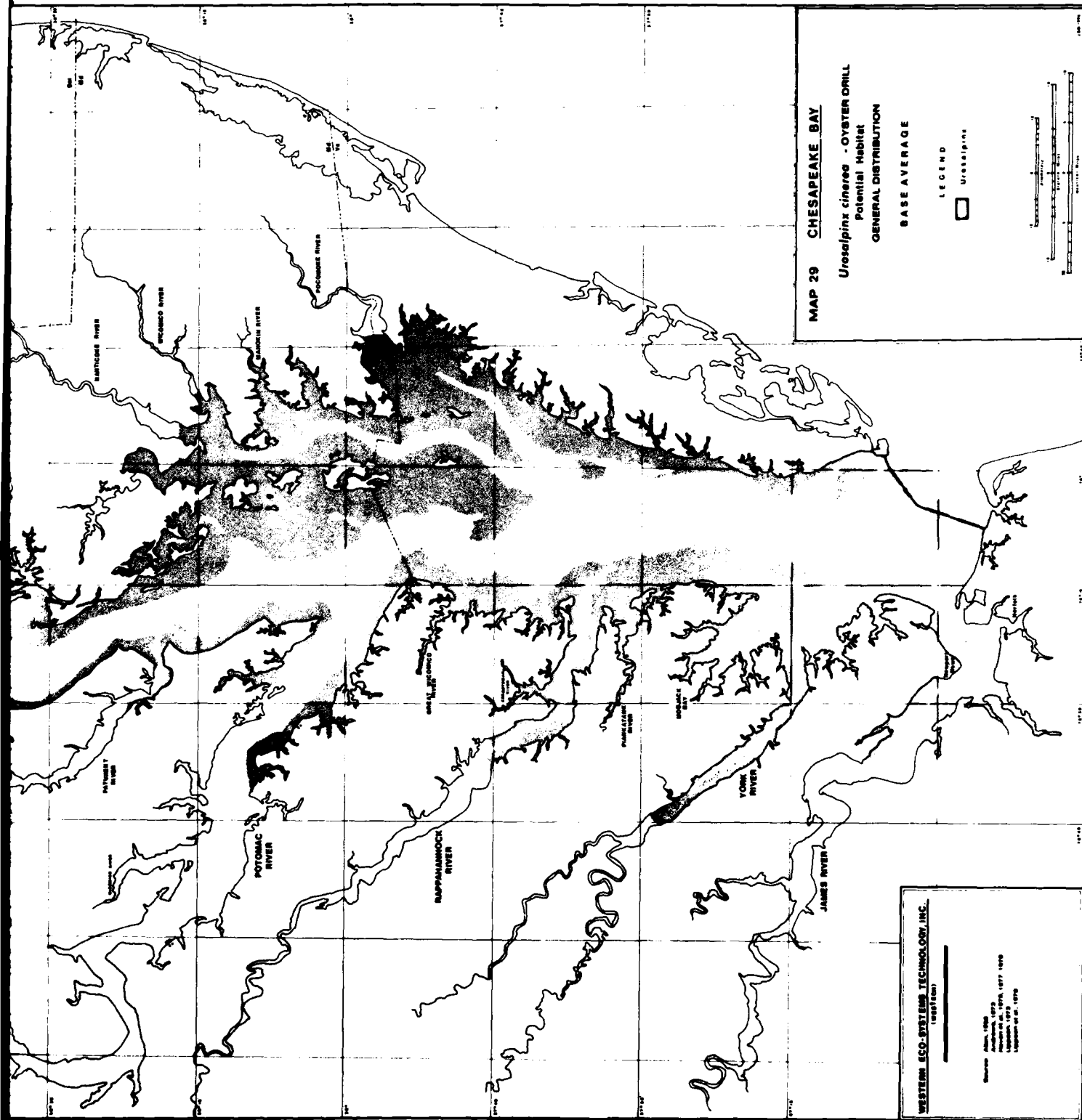
22  
NL

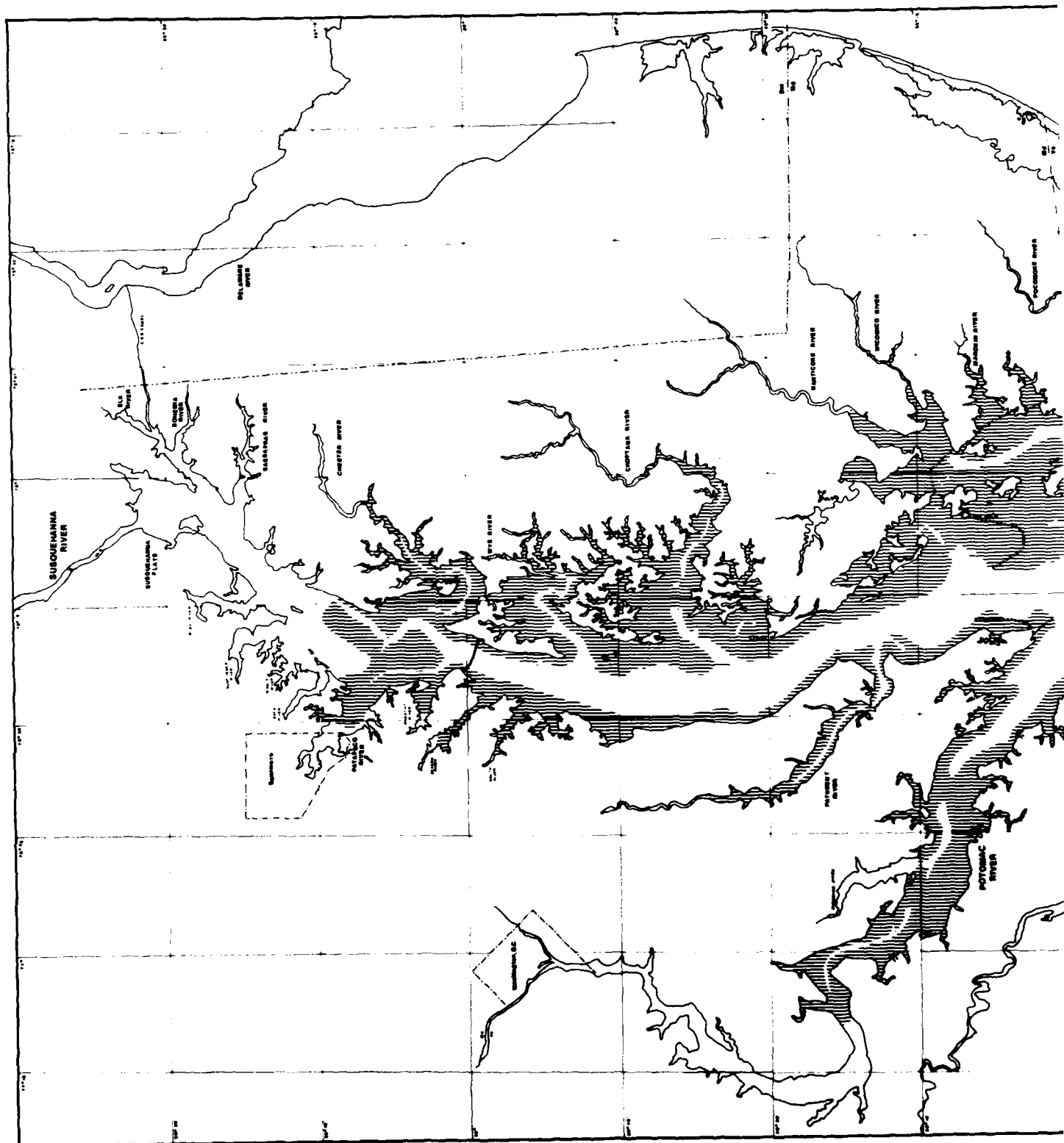


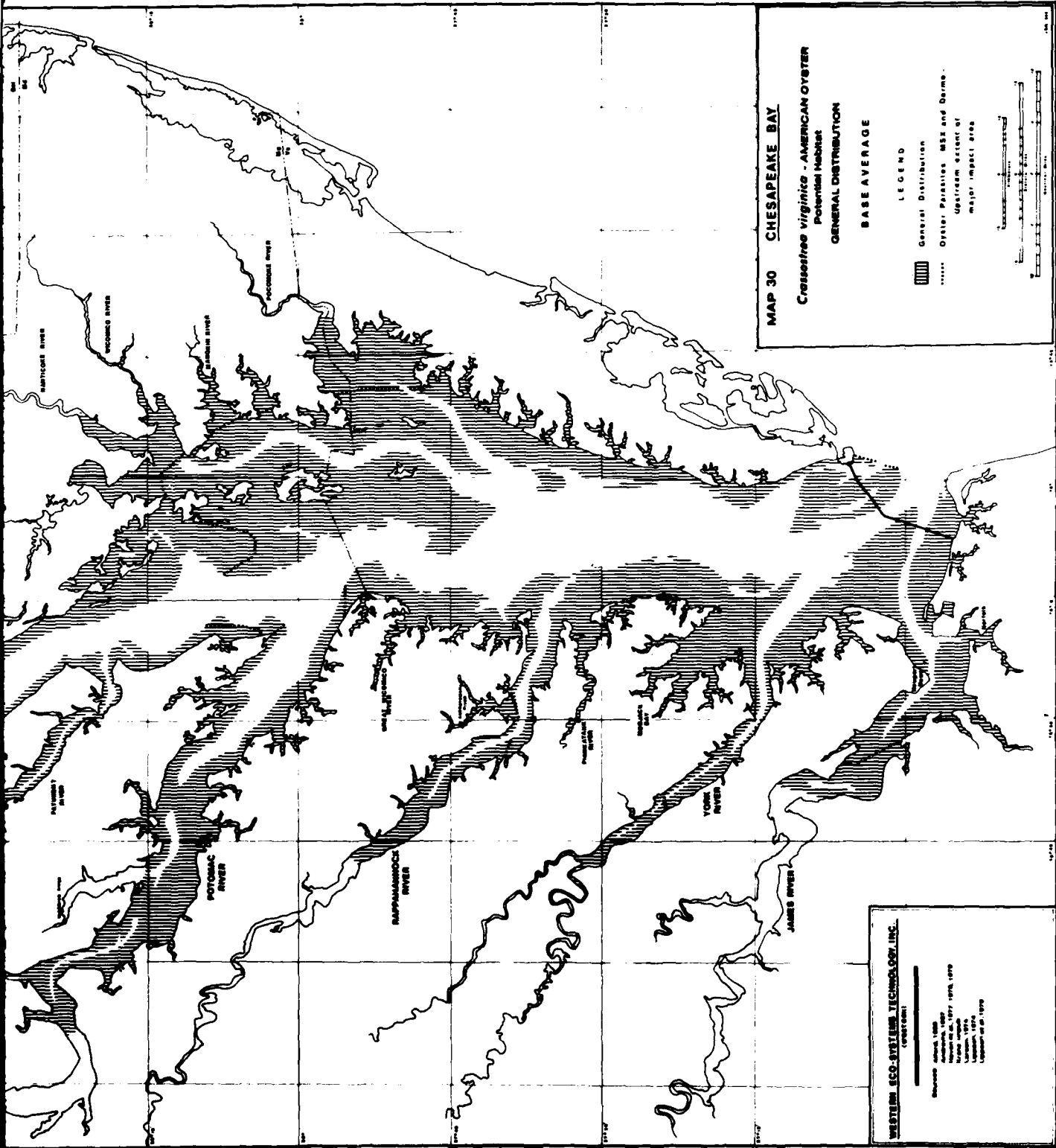


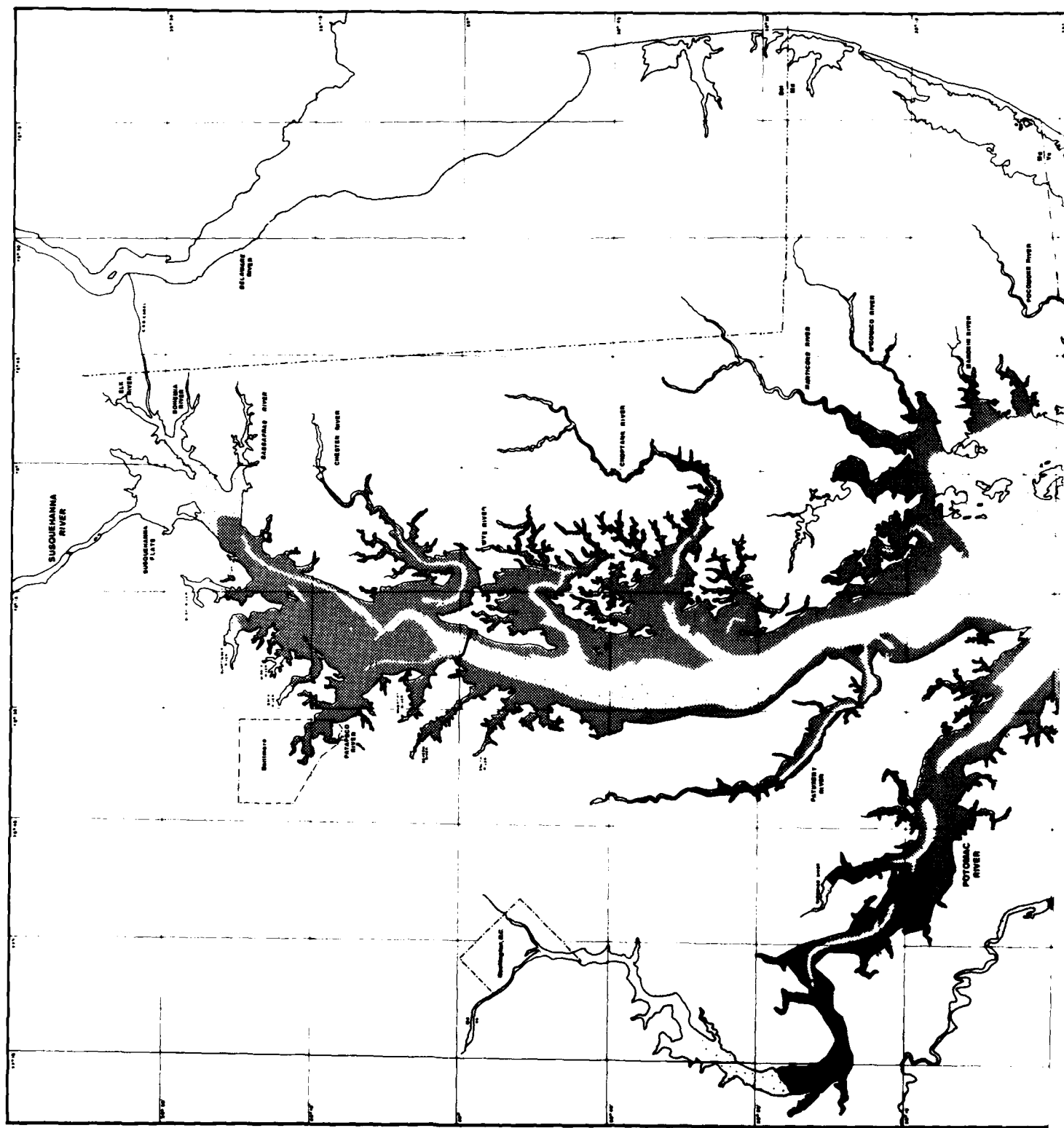
MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

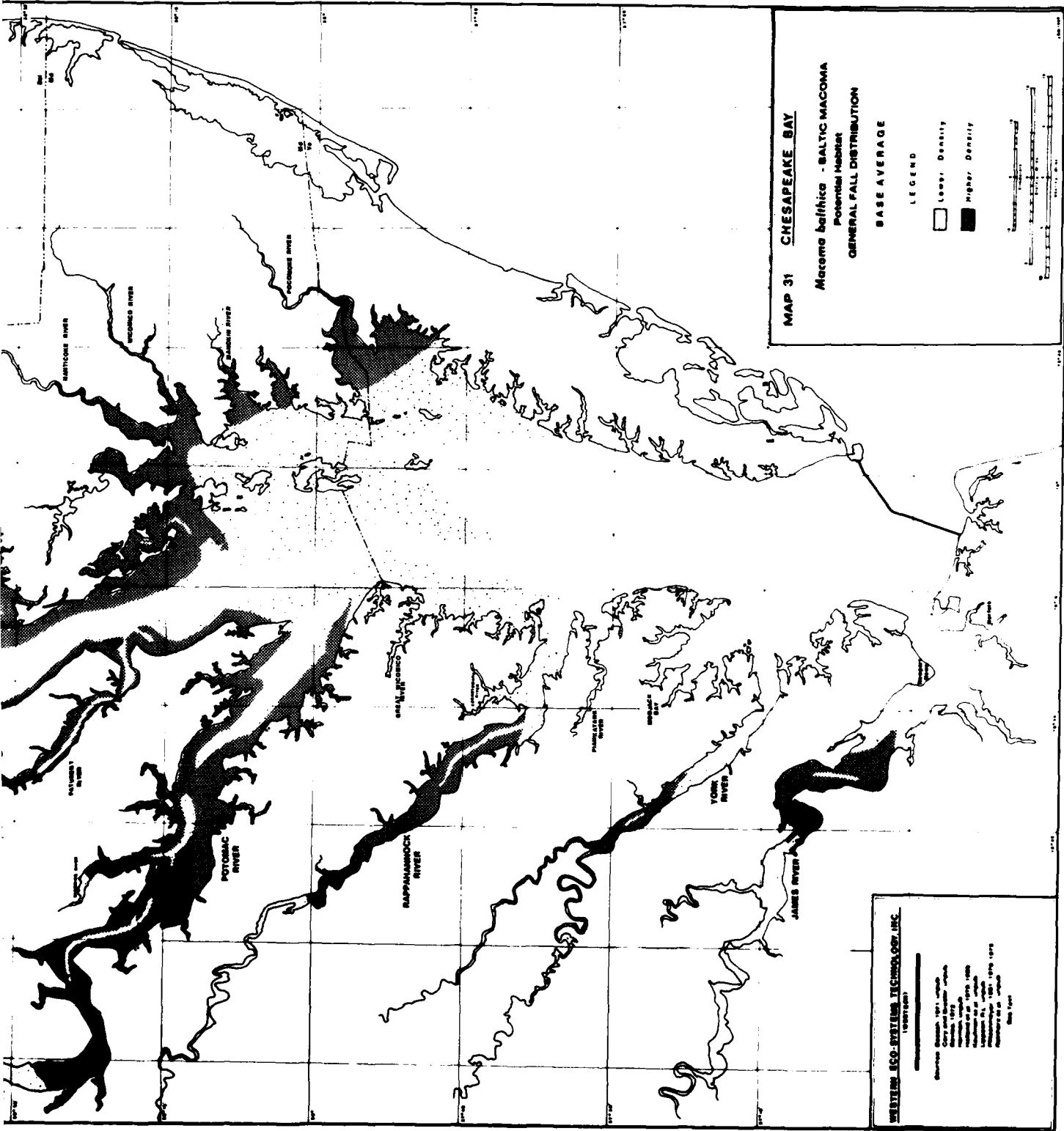


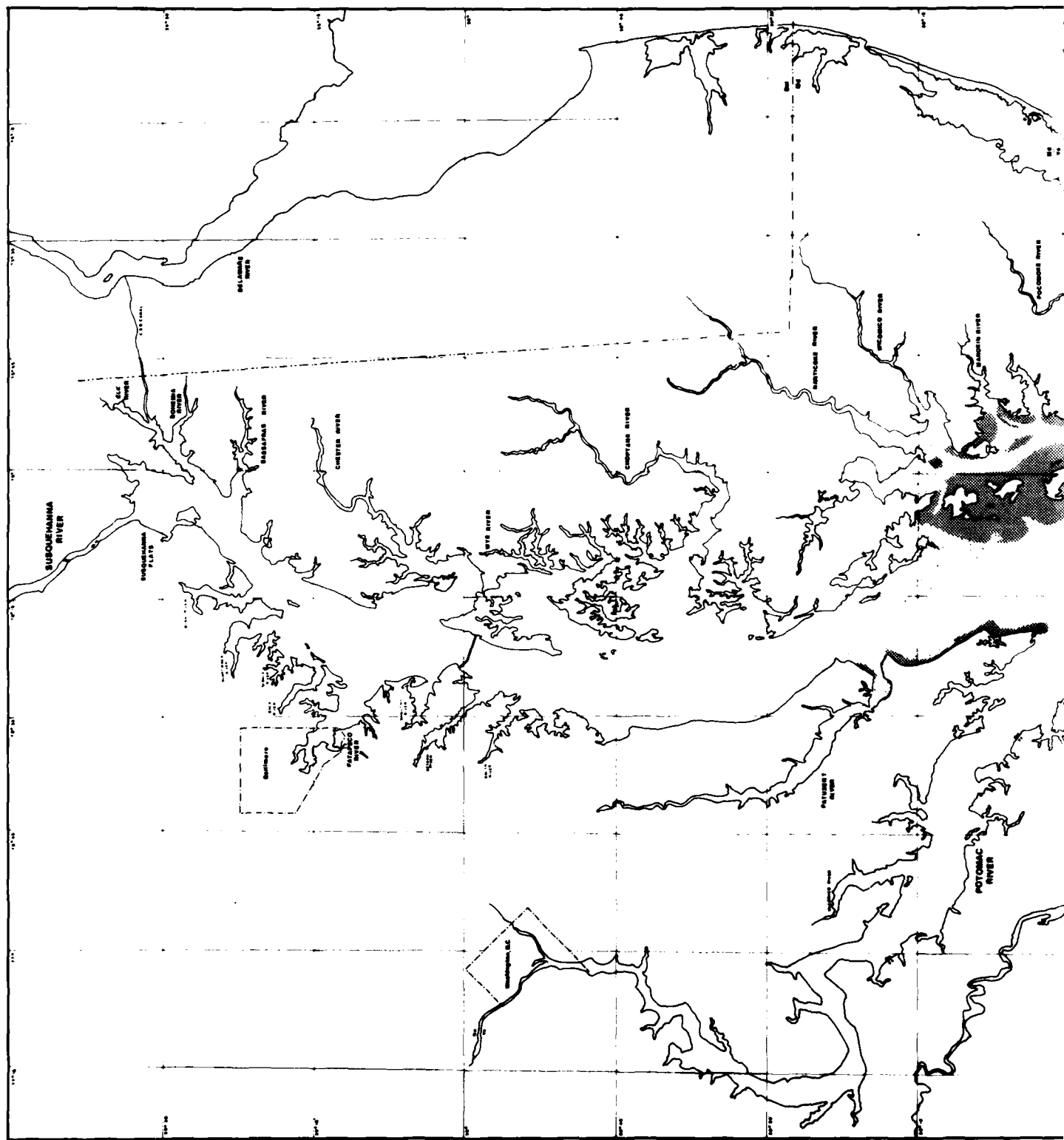


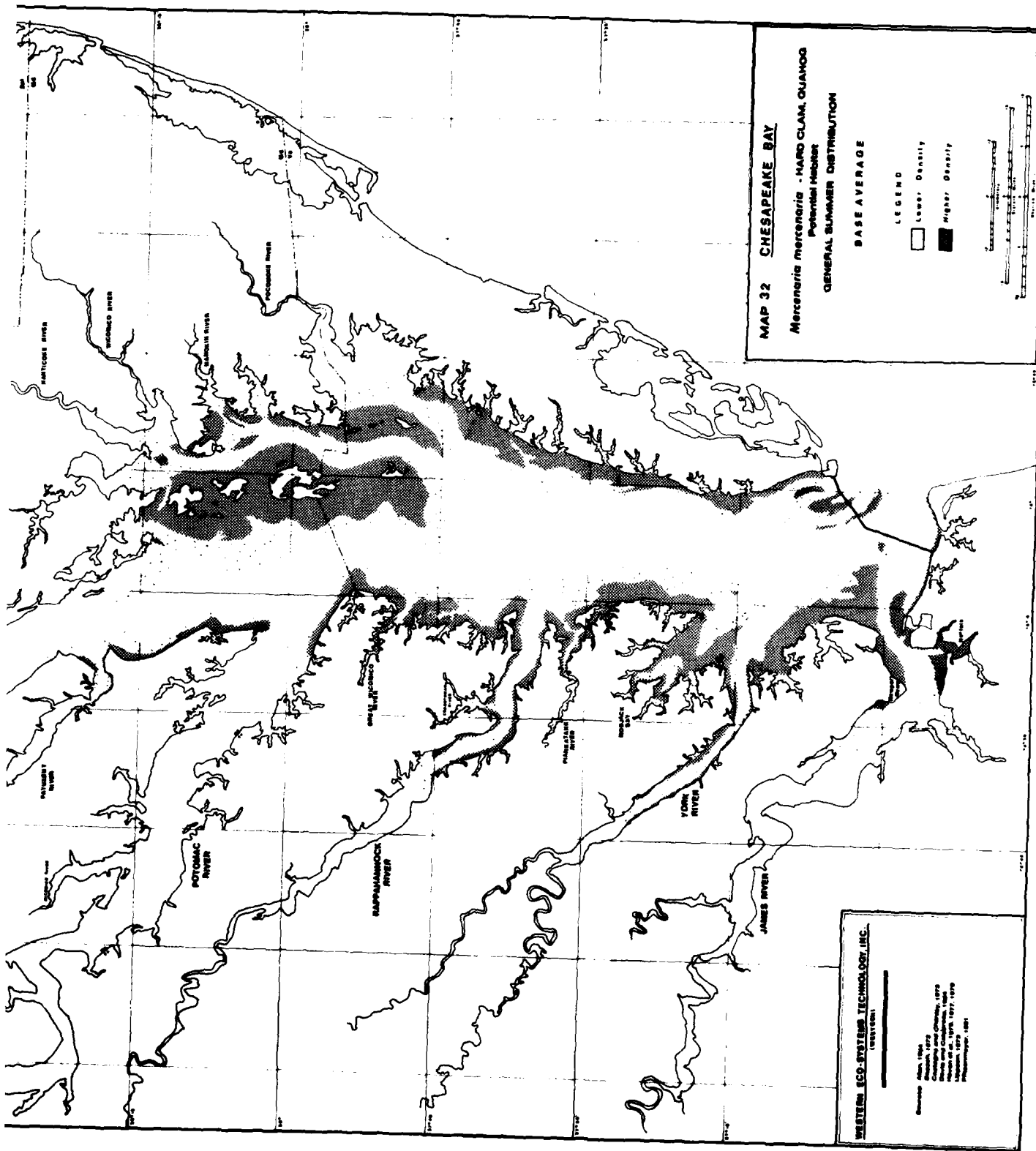


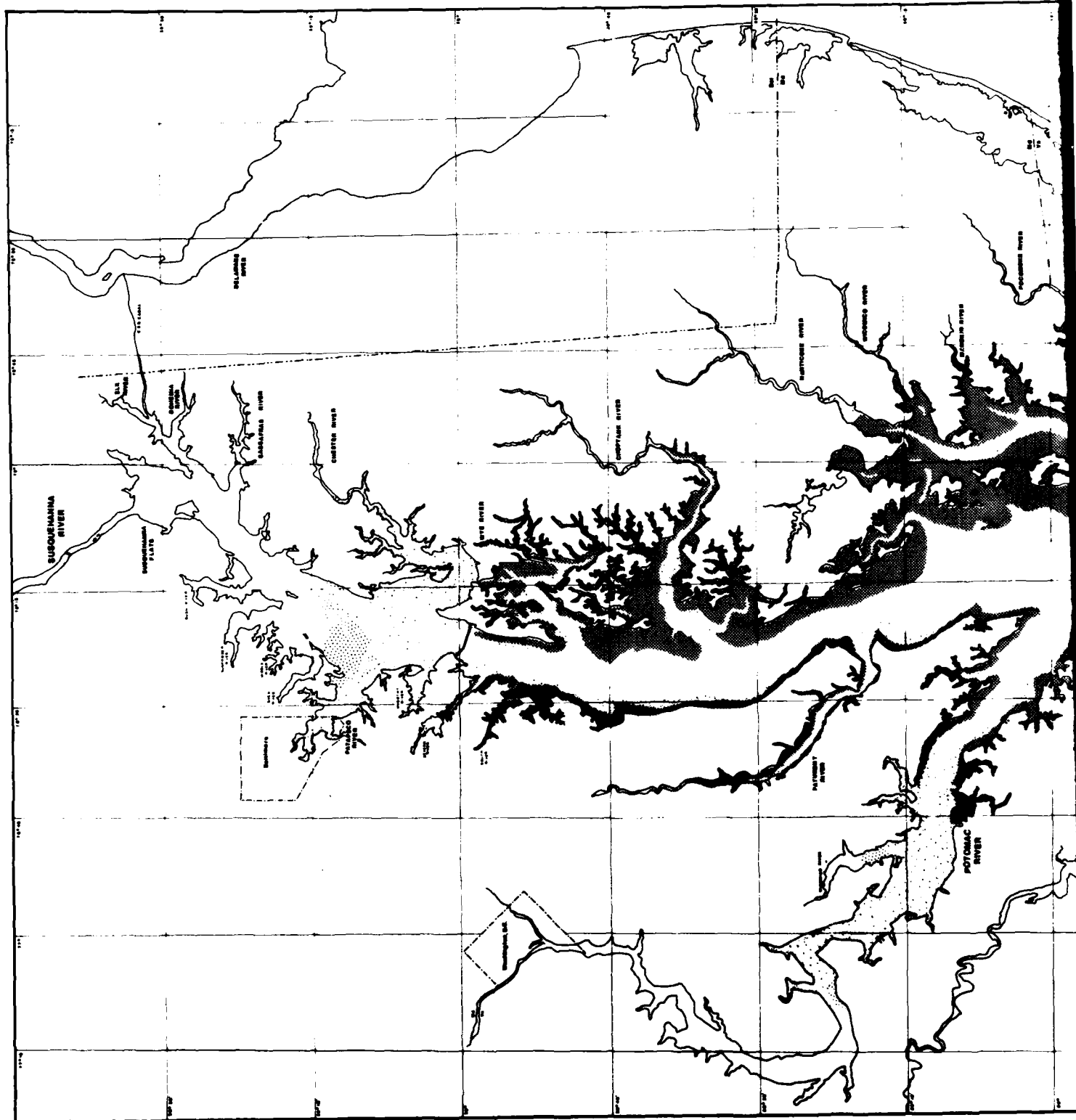






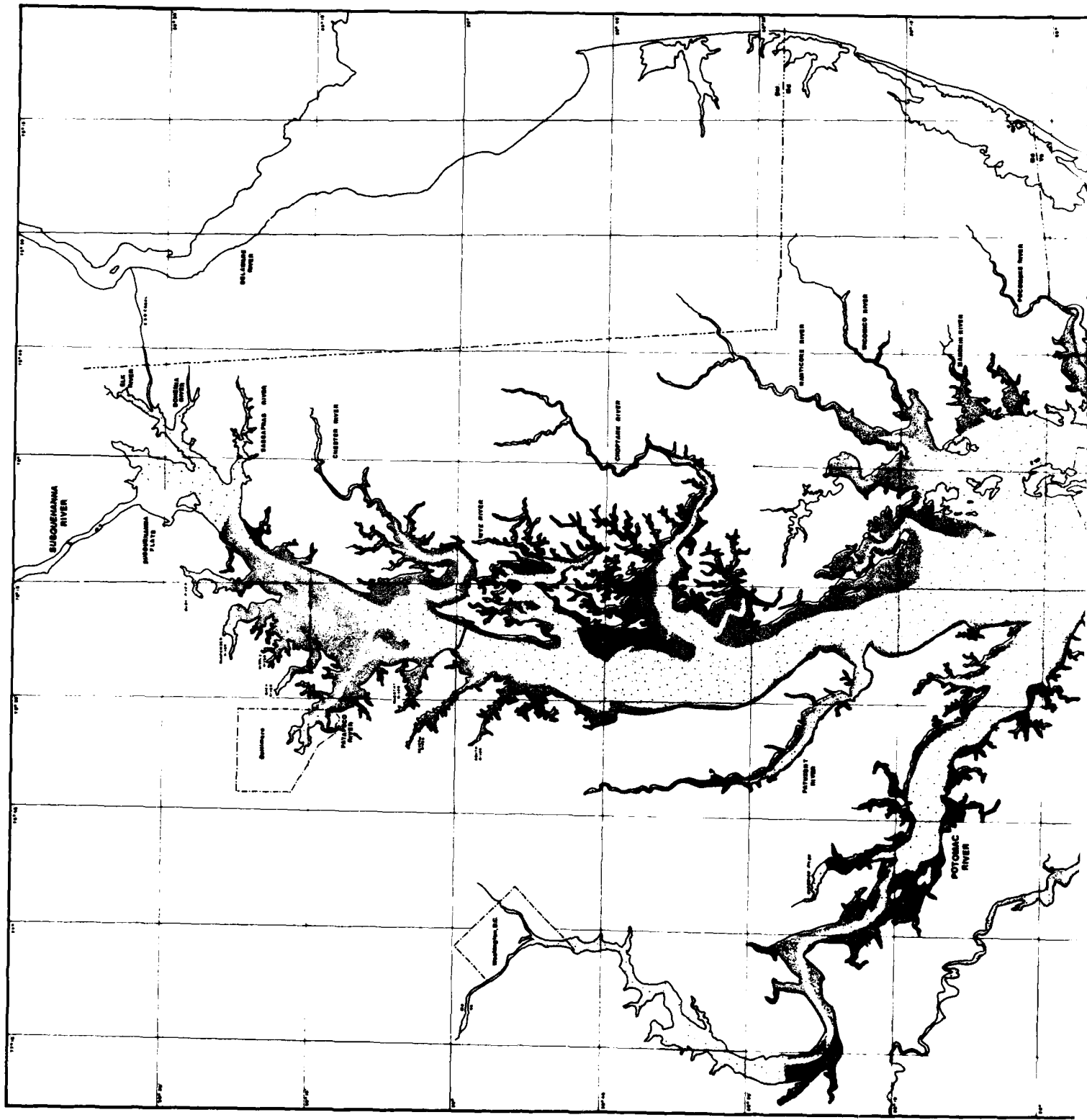




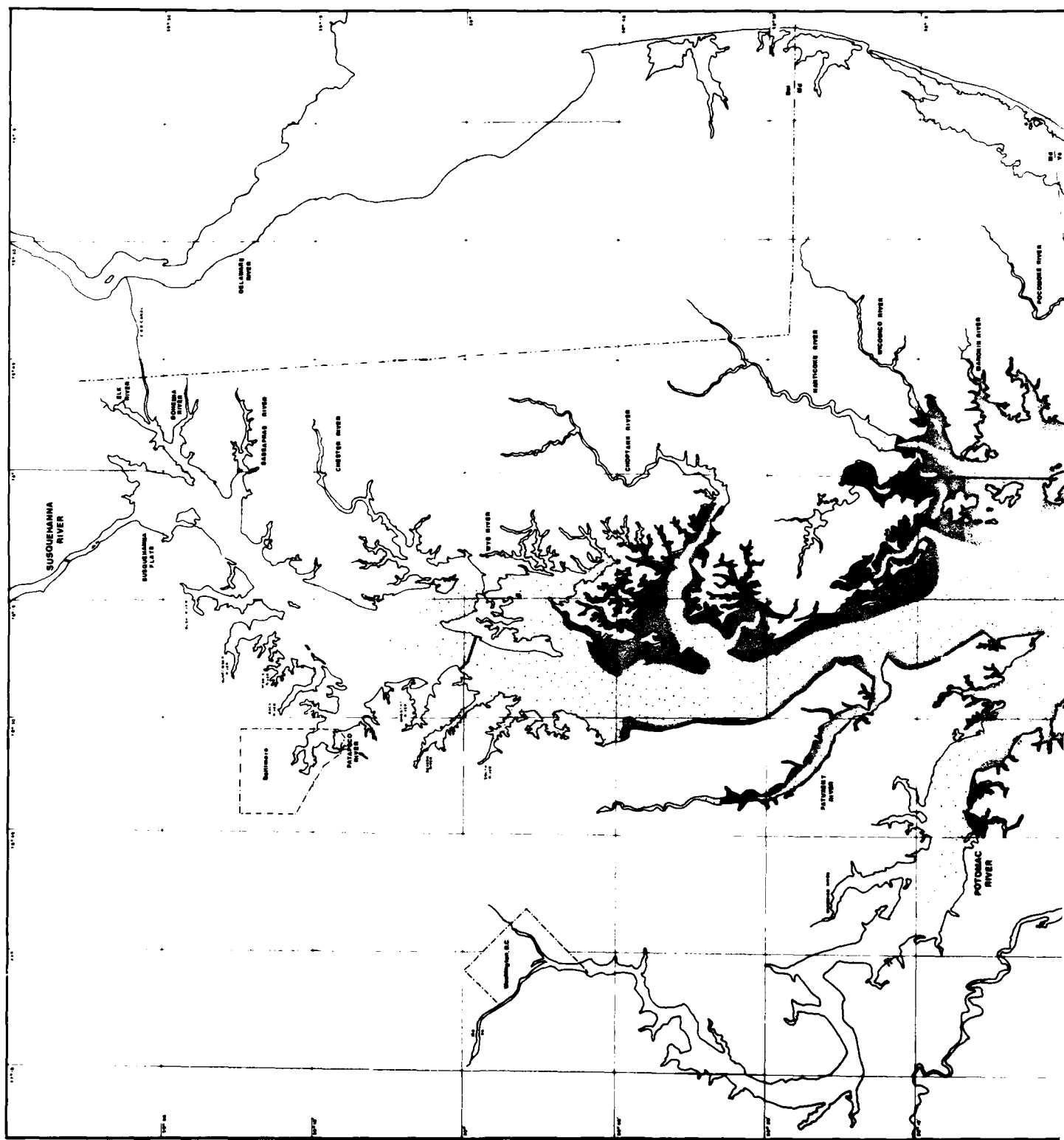


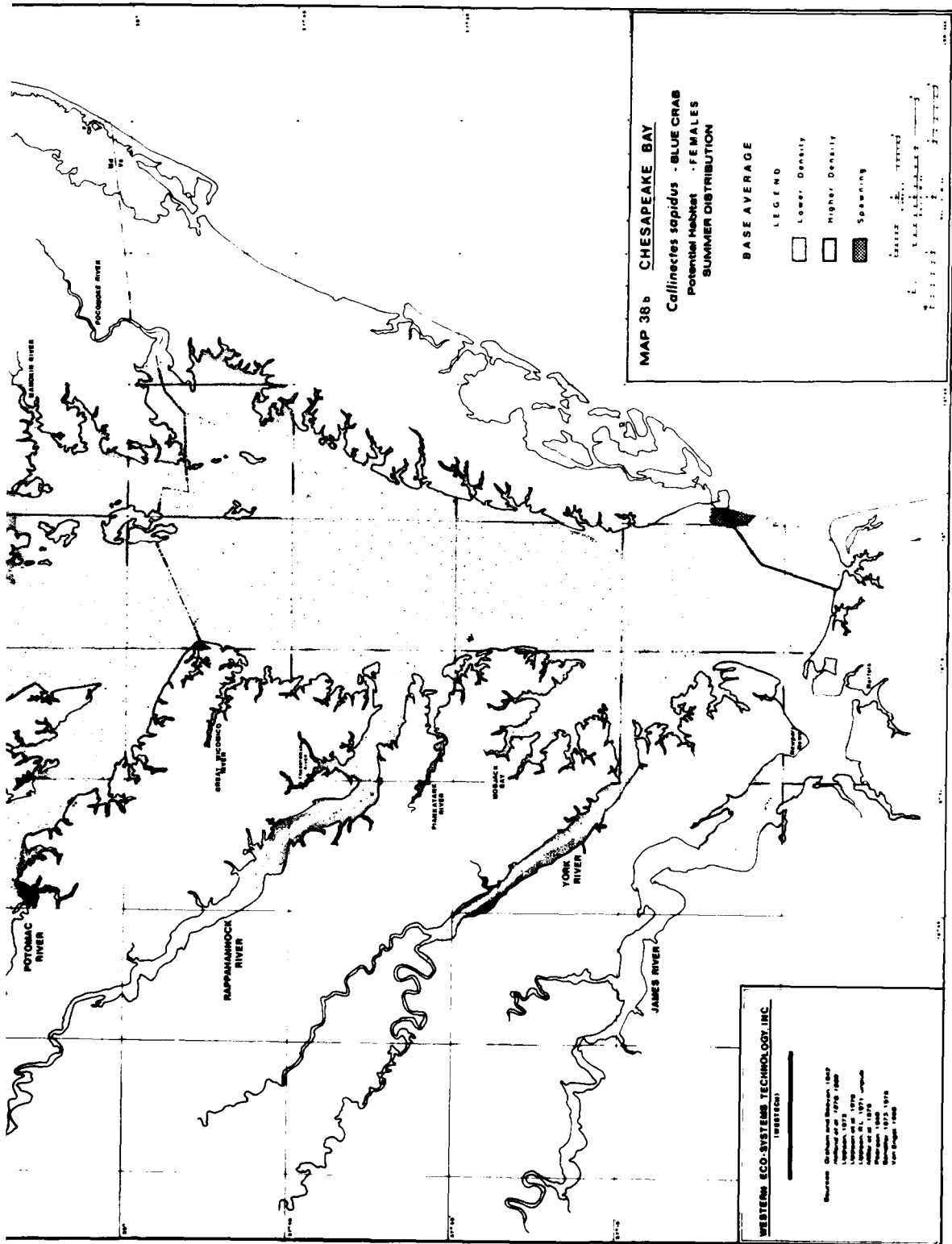












MAP 38b CHESAPEAKE BAY  
*Callinectes sapidus* - BLUE CRAB  
 Potential Habitat - FEMALE  
 SUMMER DISTRIBUTION

BASE AVERAGE

LEGEND

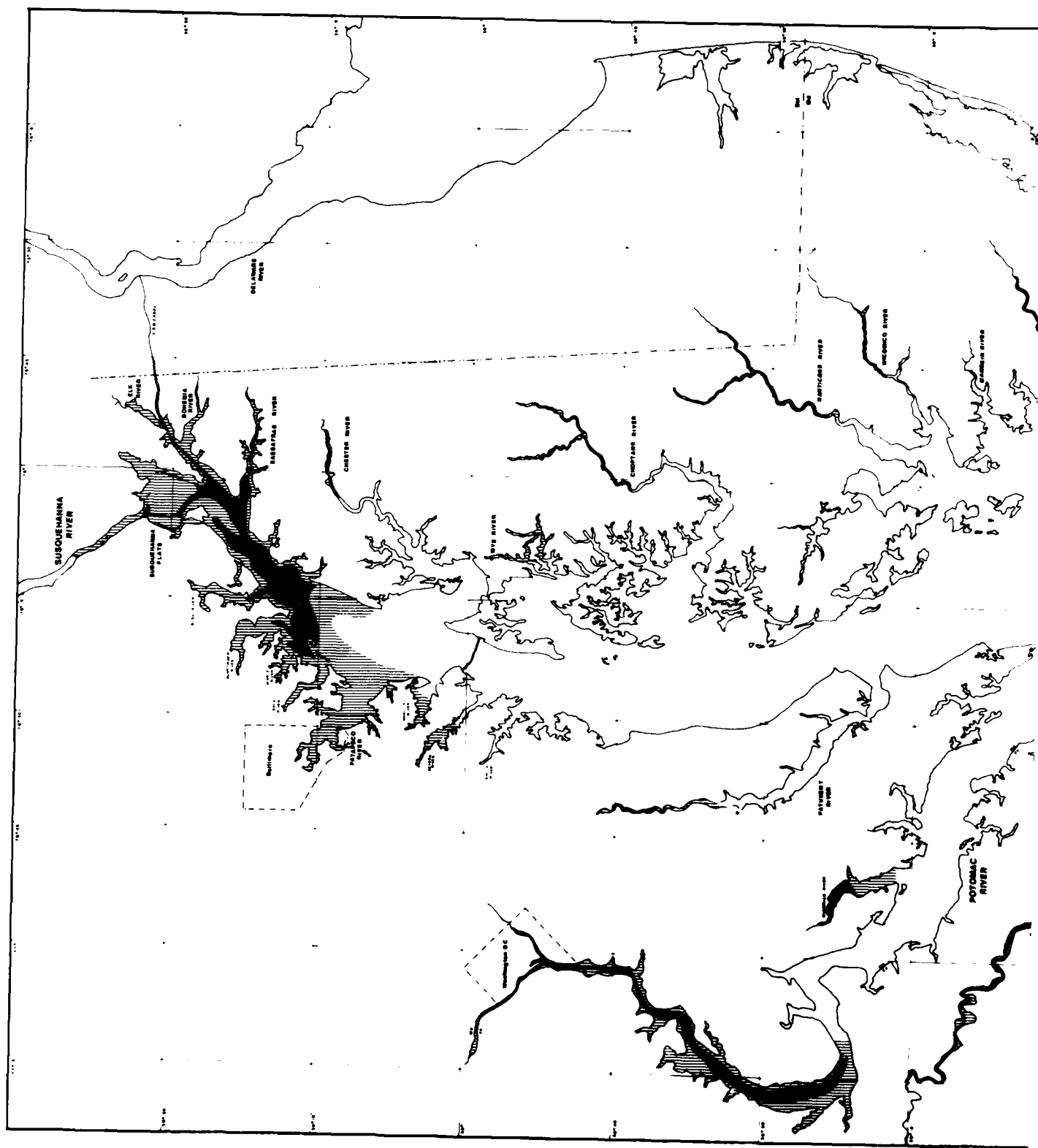
Lower Density

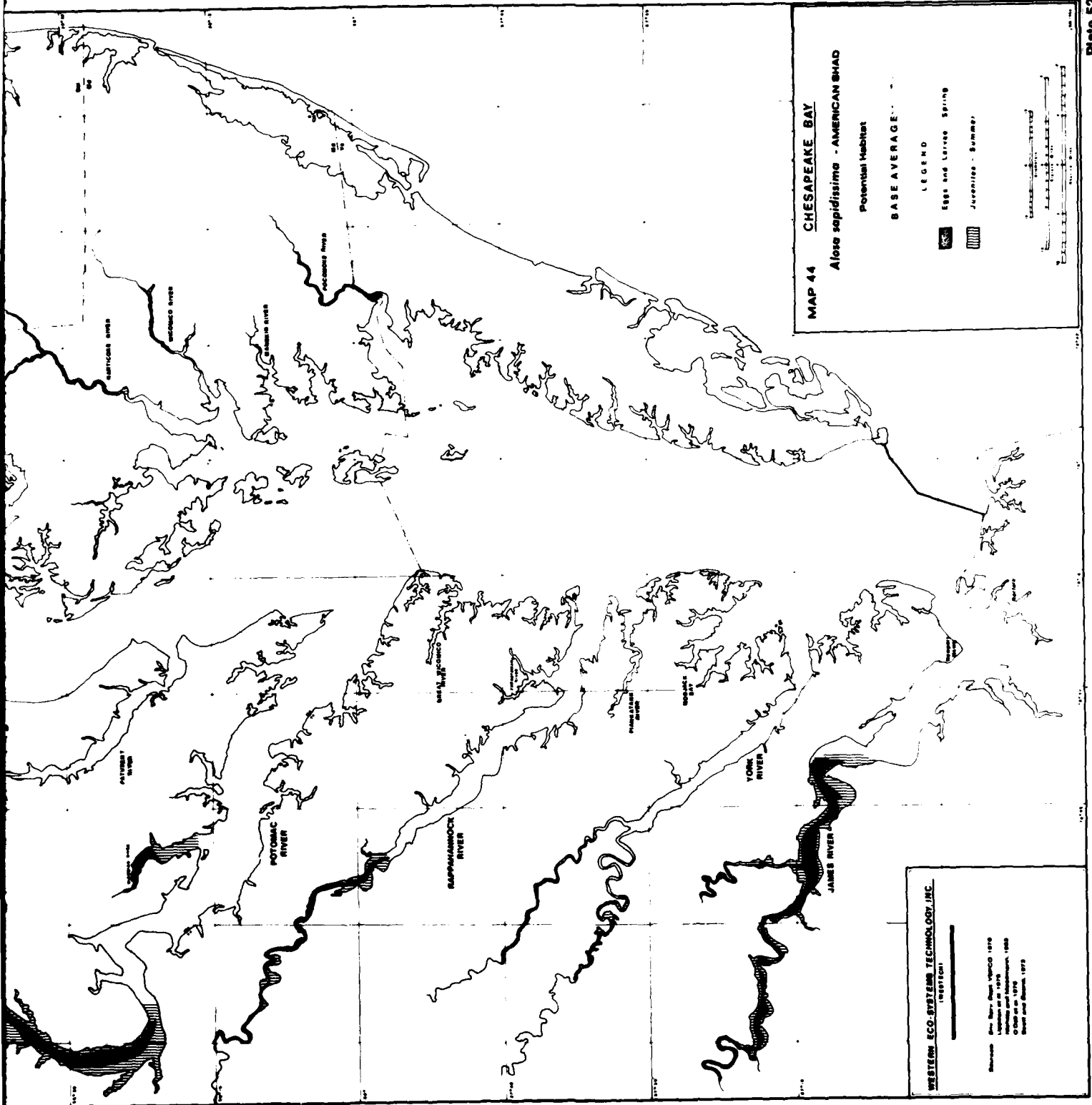
Higher Density

Spawning

WESTERN ECO-SYSTEMS TECHNOLOGY, INC.  
 INVESTIGATOR

Source: Graham and Morgan, 1967  
 Hobbins et al., 1970, 1980  
 Hobbins, 1971  
 Hobbins, 1972  
 Hobbins, 1973, 1974, 1975  
 Hobbins, 1975, 1976  
 Hobbins, 1977





**MAP 44 CHESAPEAKE BAY**

**Alosa sapidissima - AMERICAN SHAD**

Potential Habitat

BASE AVERAGE

LEGEND

Eggs and Larvae Spring

Juveniles - Summer

Scale: 0 to 10 Miles

**WESTERN ECO-SYSTEM TECHNOLOGY, INC.**

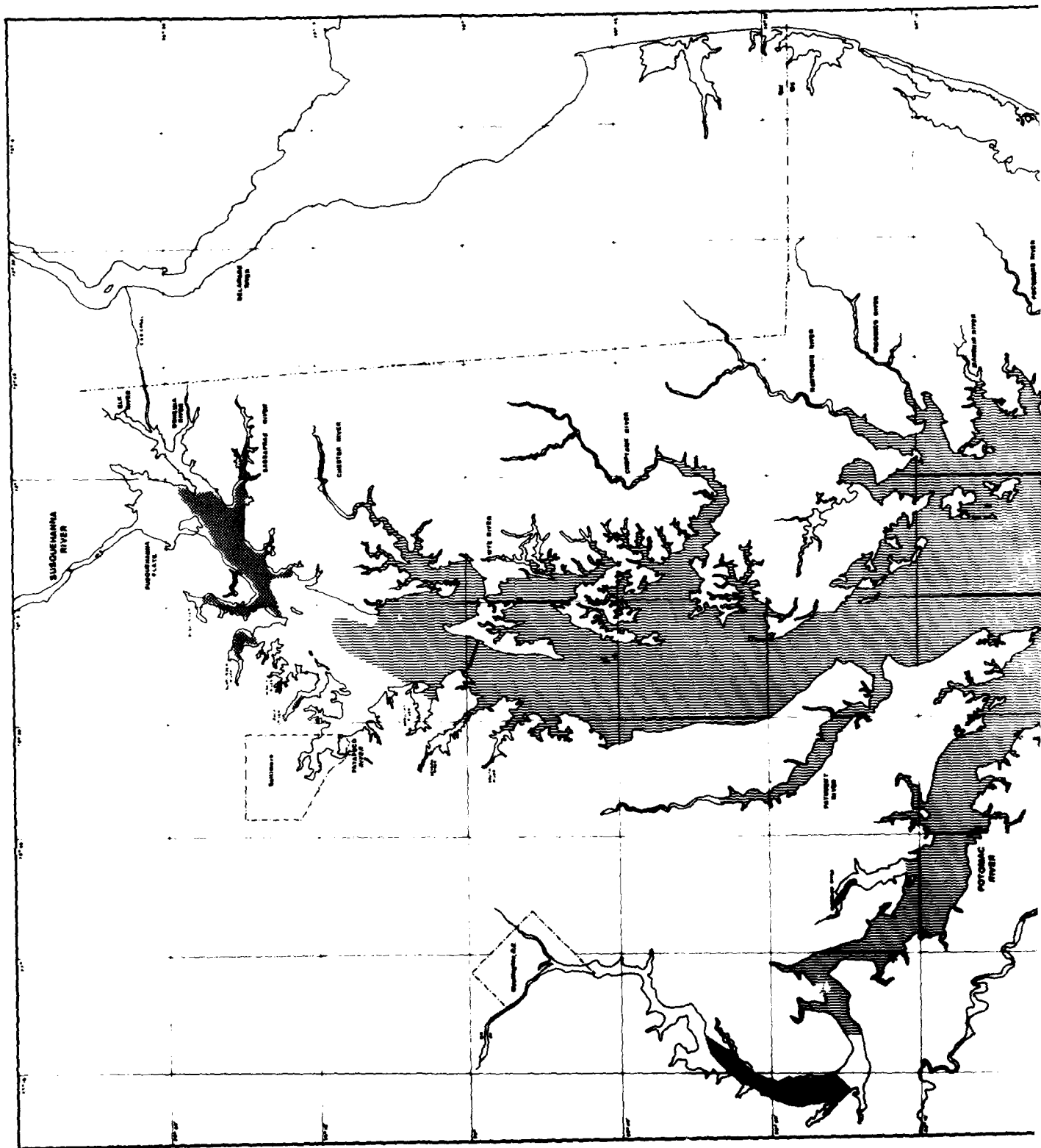
INVESTMENT

Developed from Data Base Update 1979

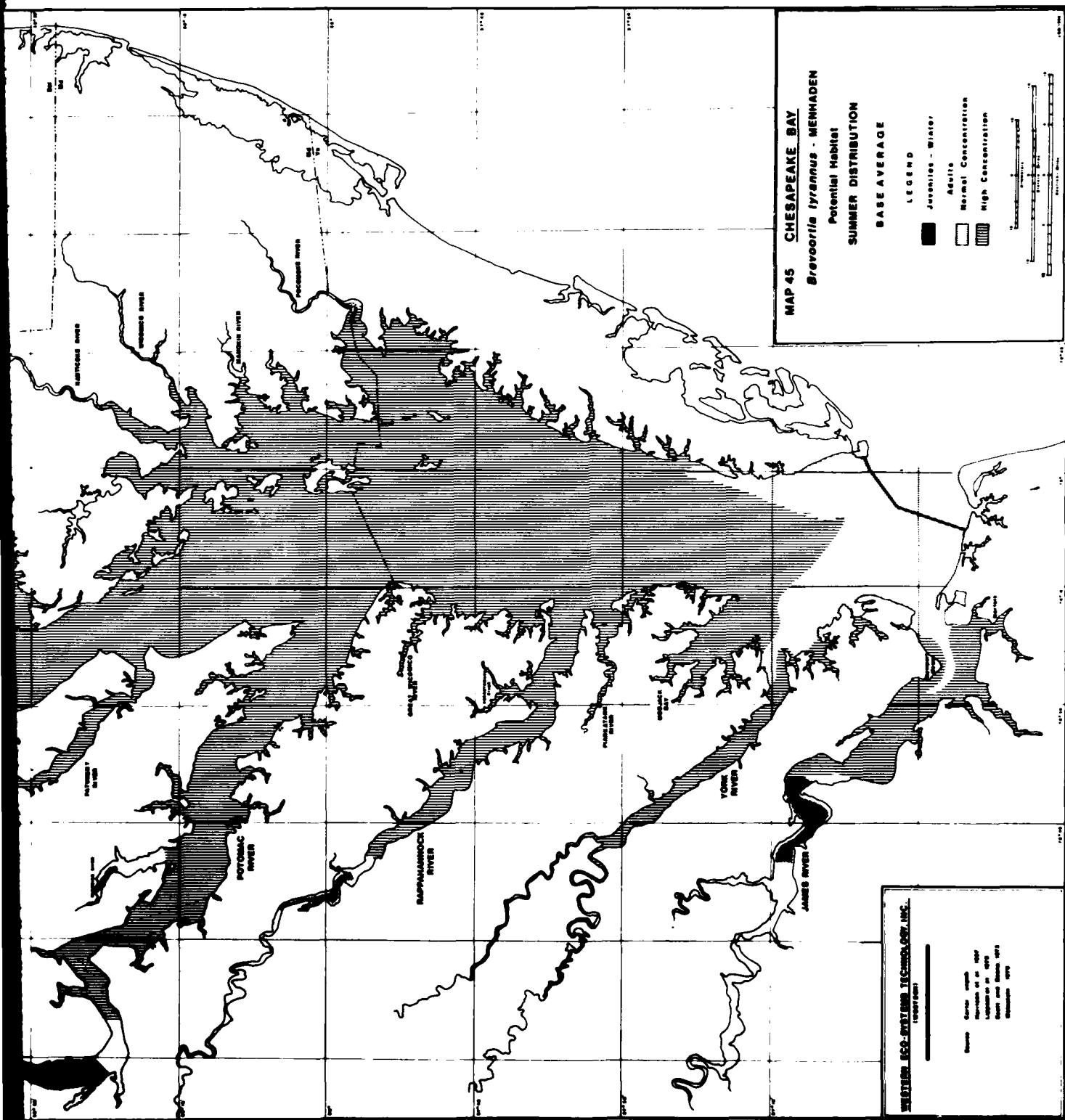
Updated to 1979

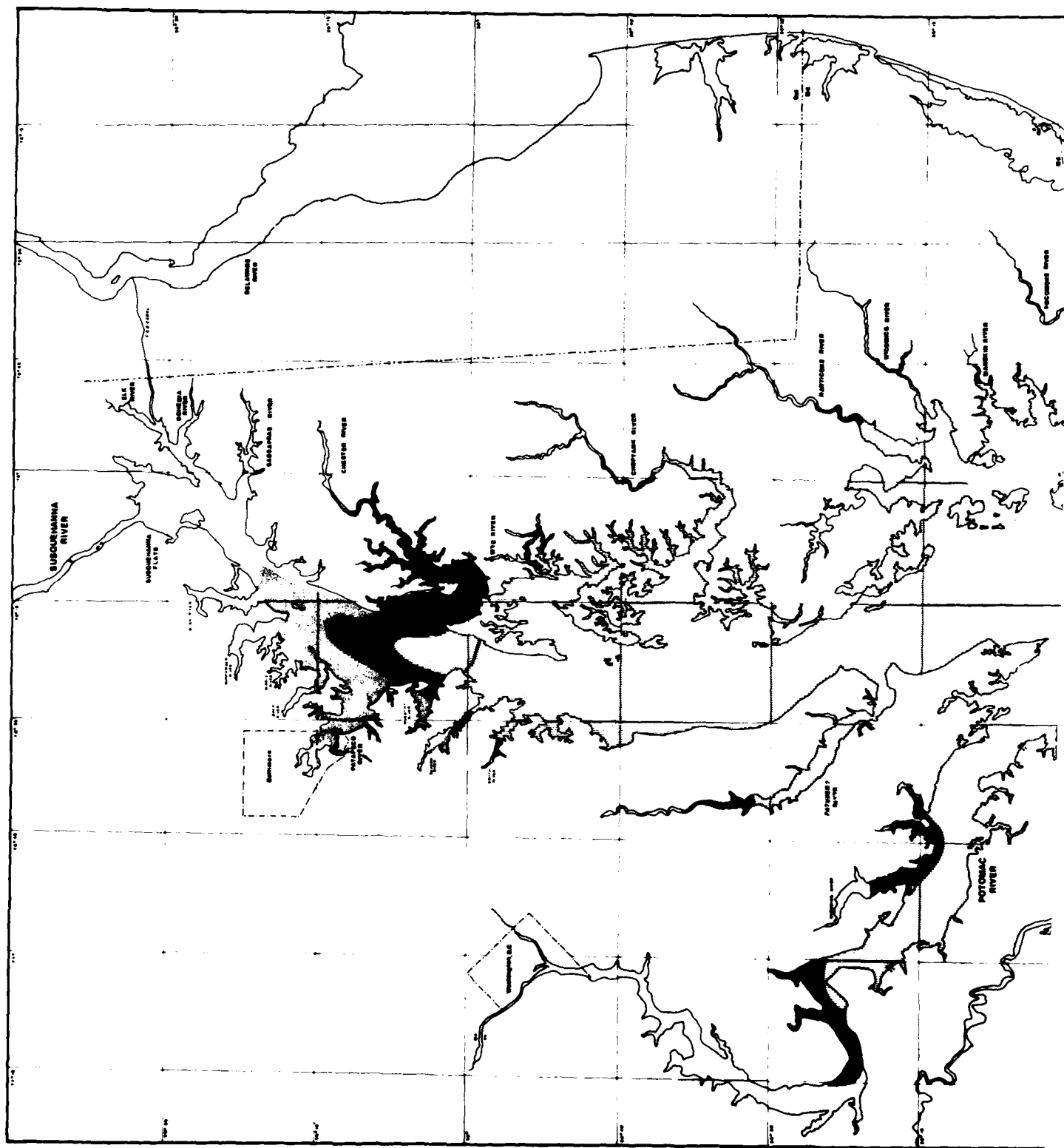
Original Data Base 1975

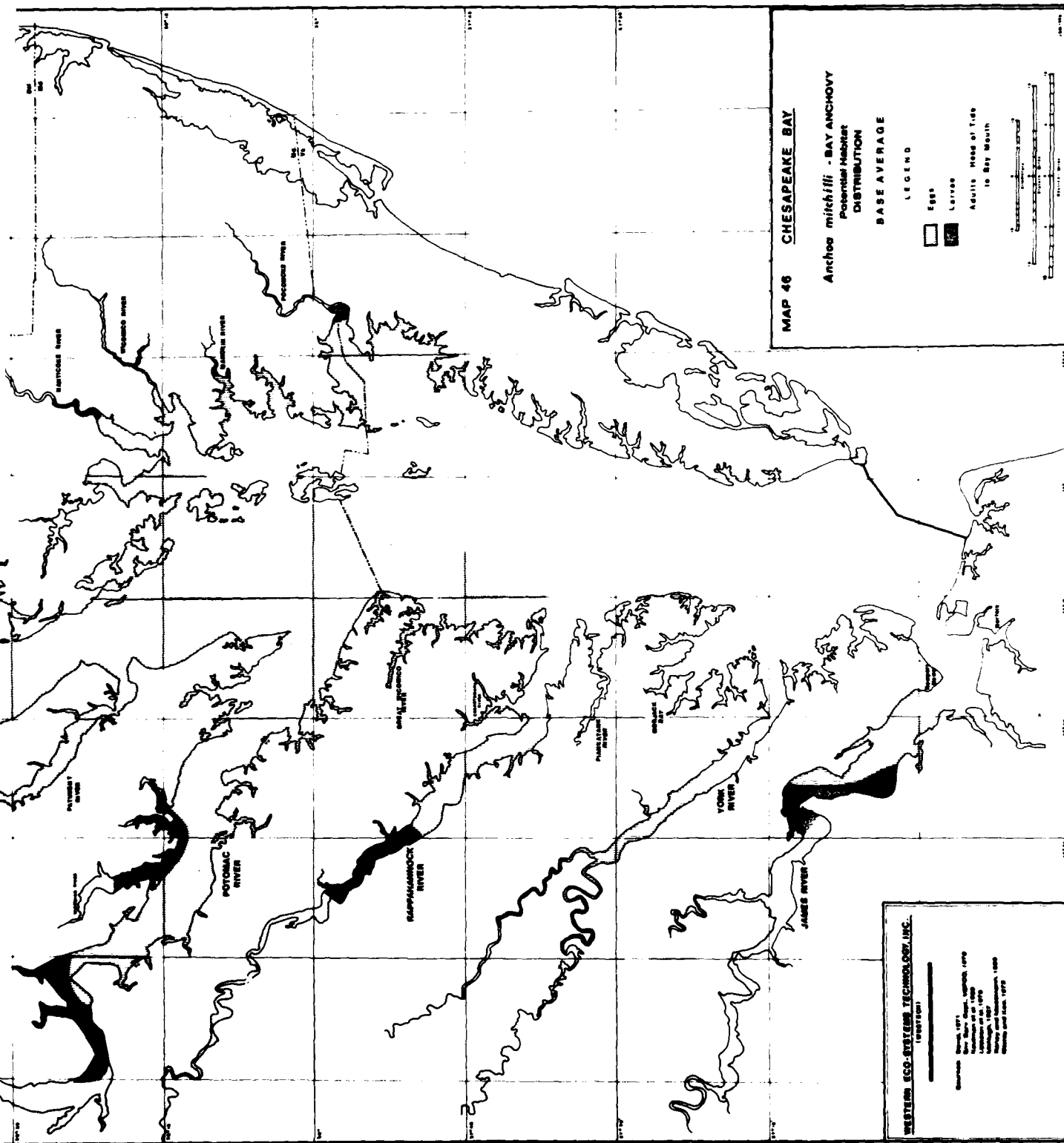
Original Data Base 1973

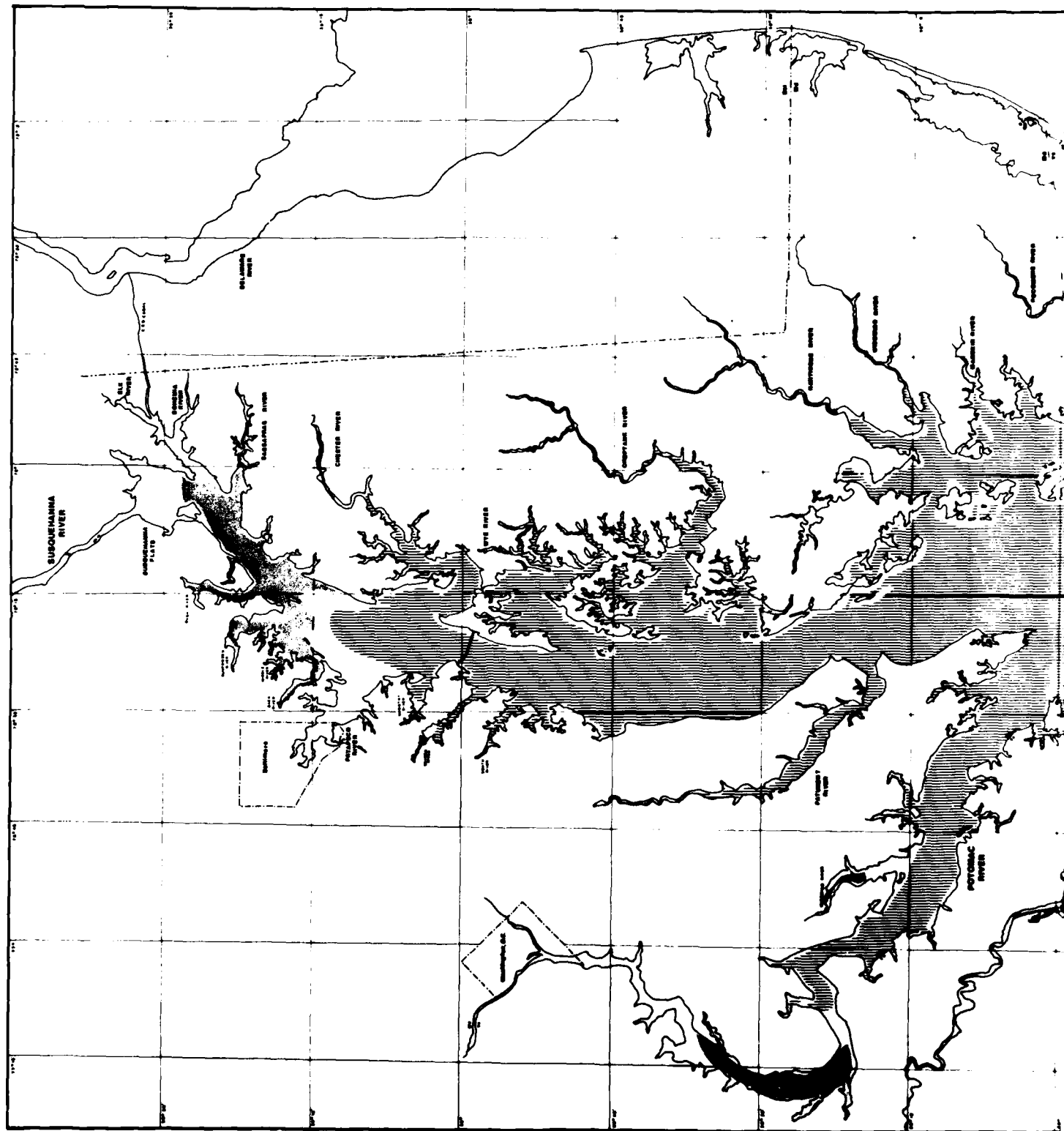


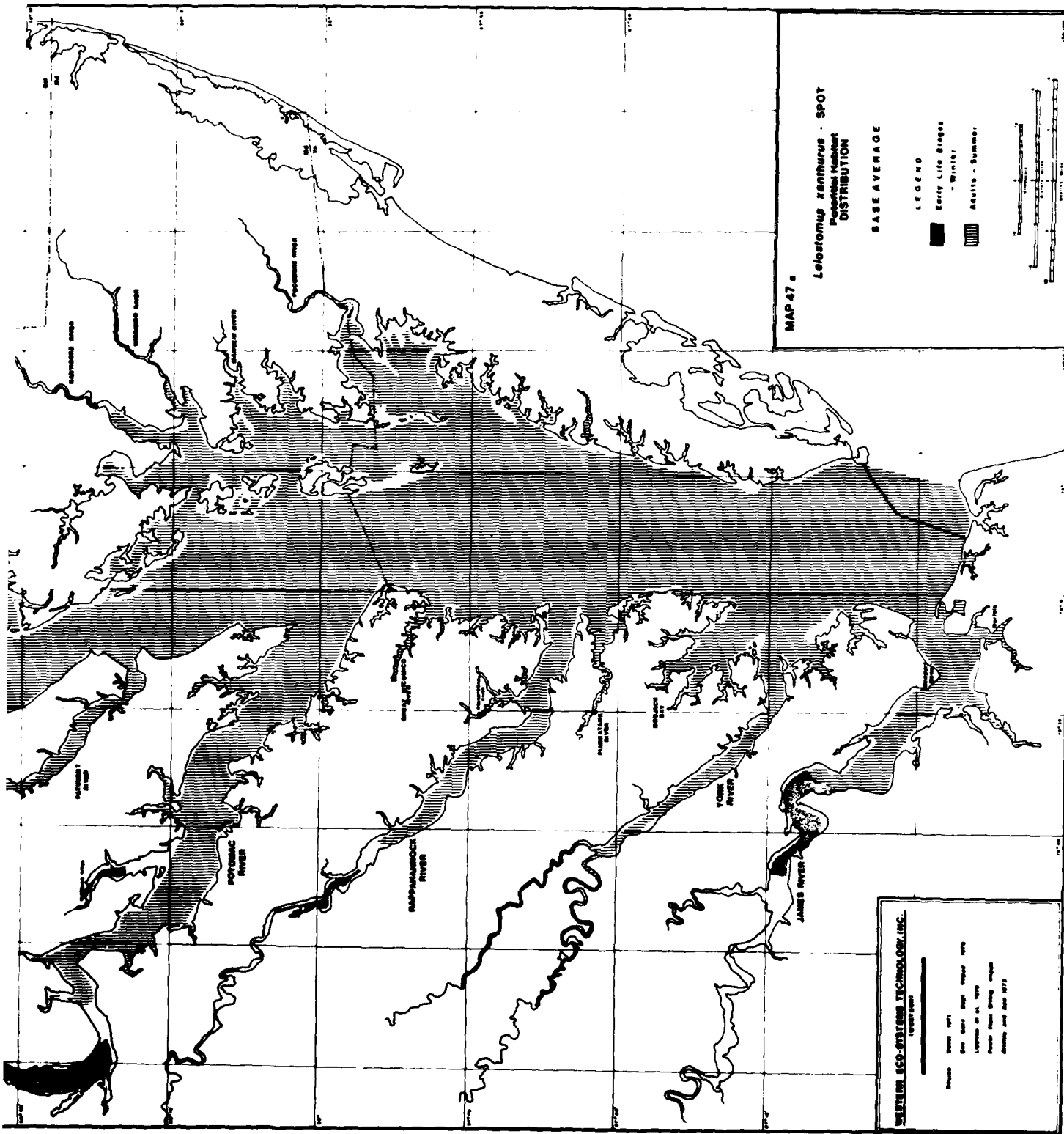


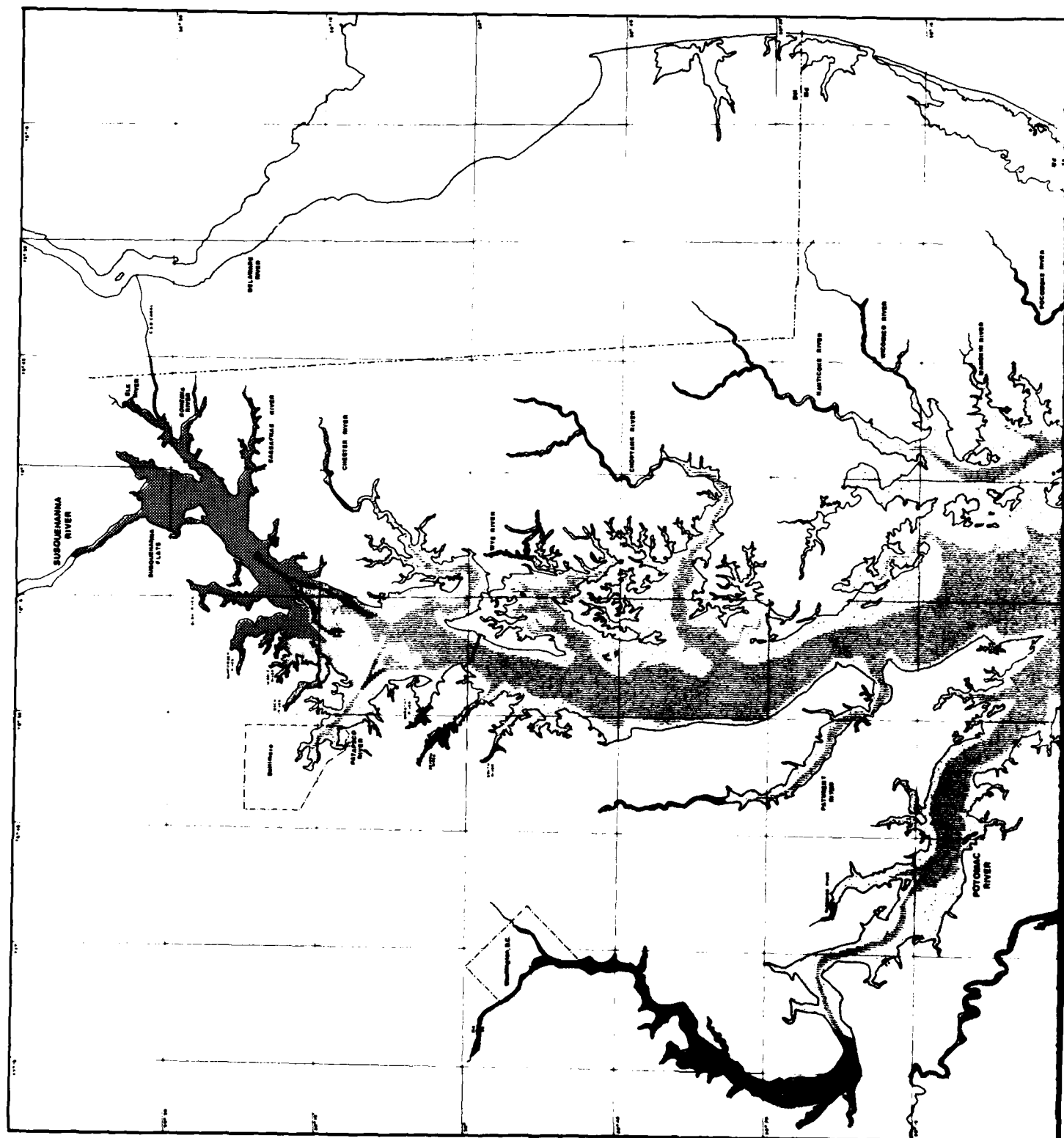


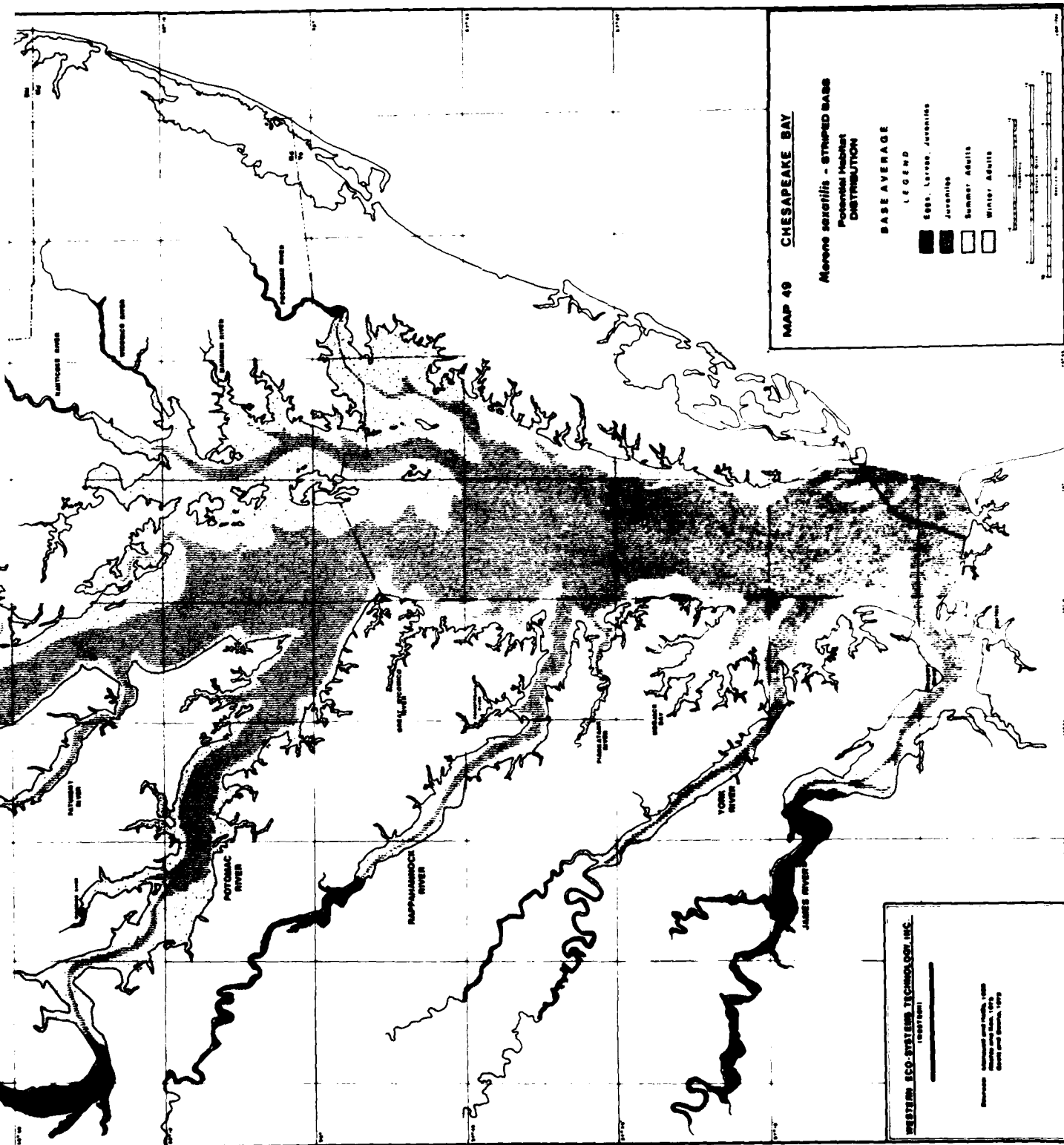












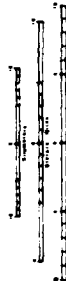
**MAP 49 CHESAPEAKE BAY**

***Morone saxatilis* - STRIPED BASS  
Potomac Harbor  
DISTRIBUTION**

**BASE AVERAGE**

**LEGEND**

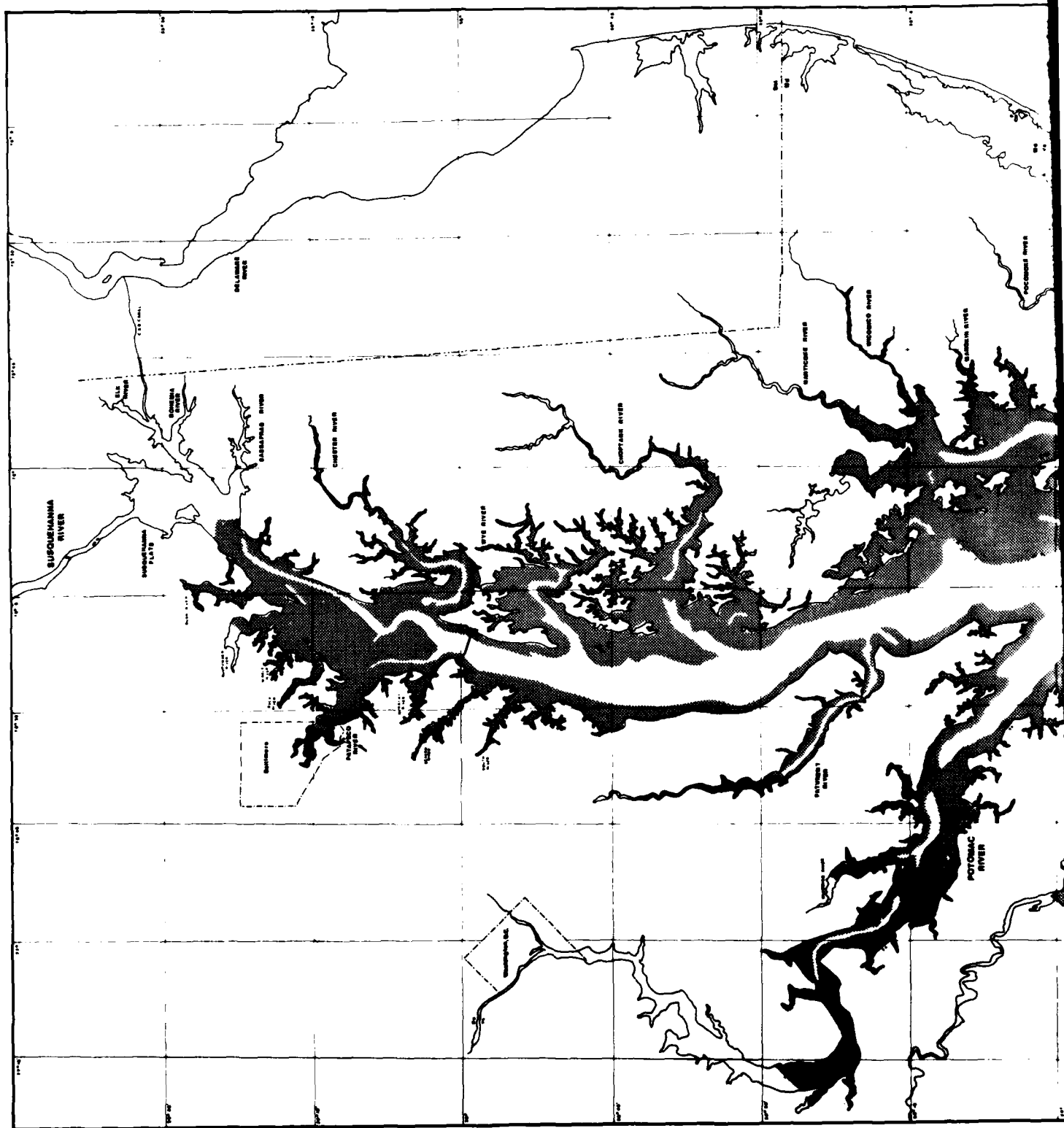
- Eggs, Larvae, Juveniles
- Juveniles
- Summer Adults
- Winter Adults



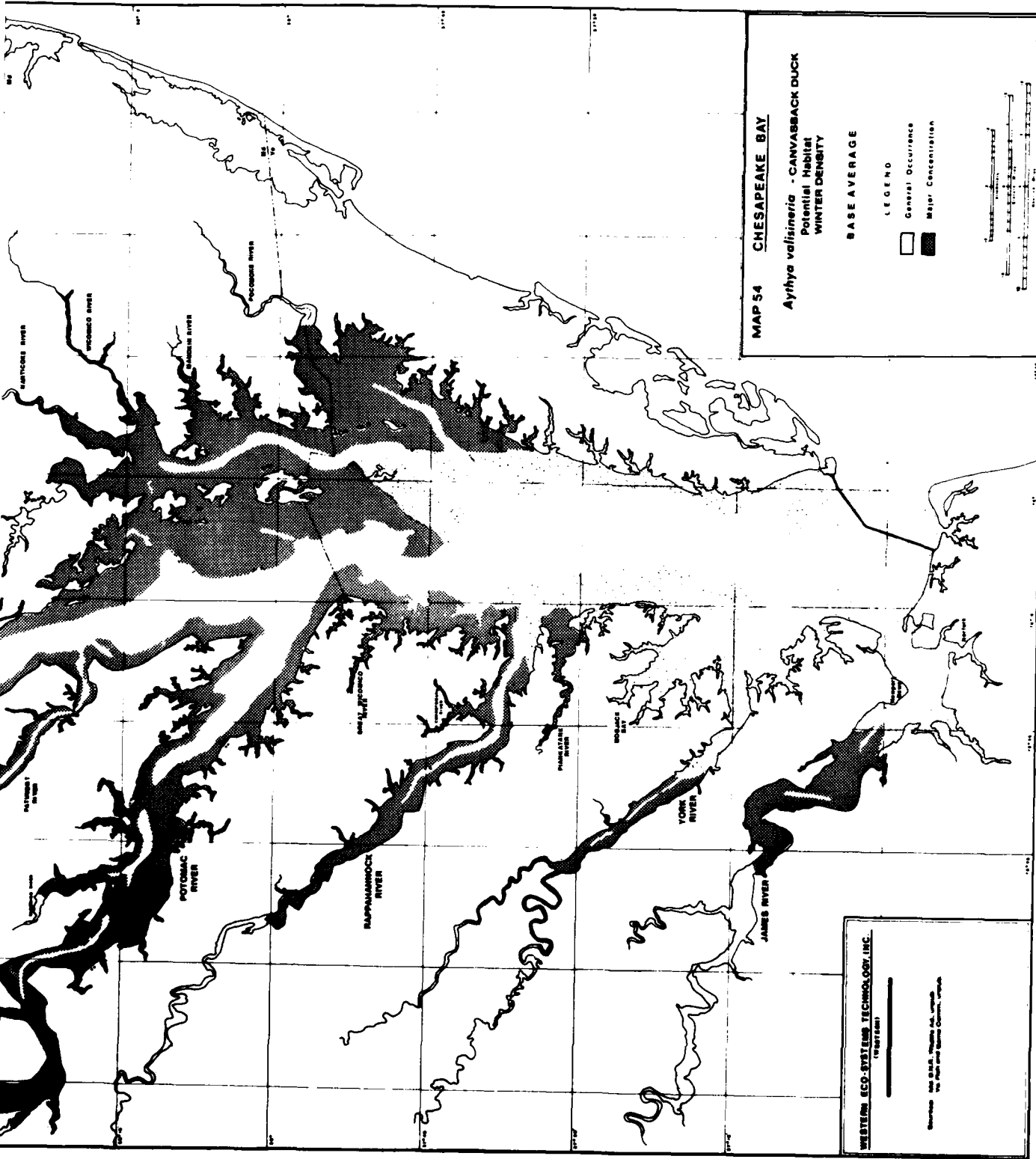
**WESTERN GEO-TECHNOLOGY, INC.**

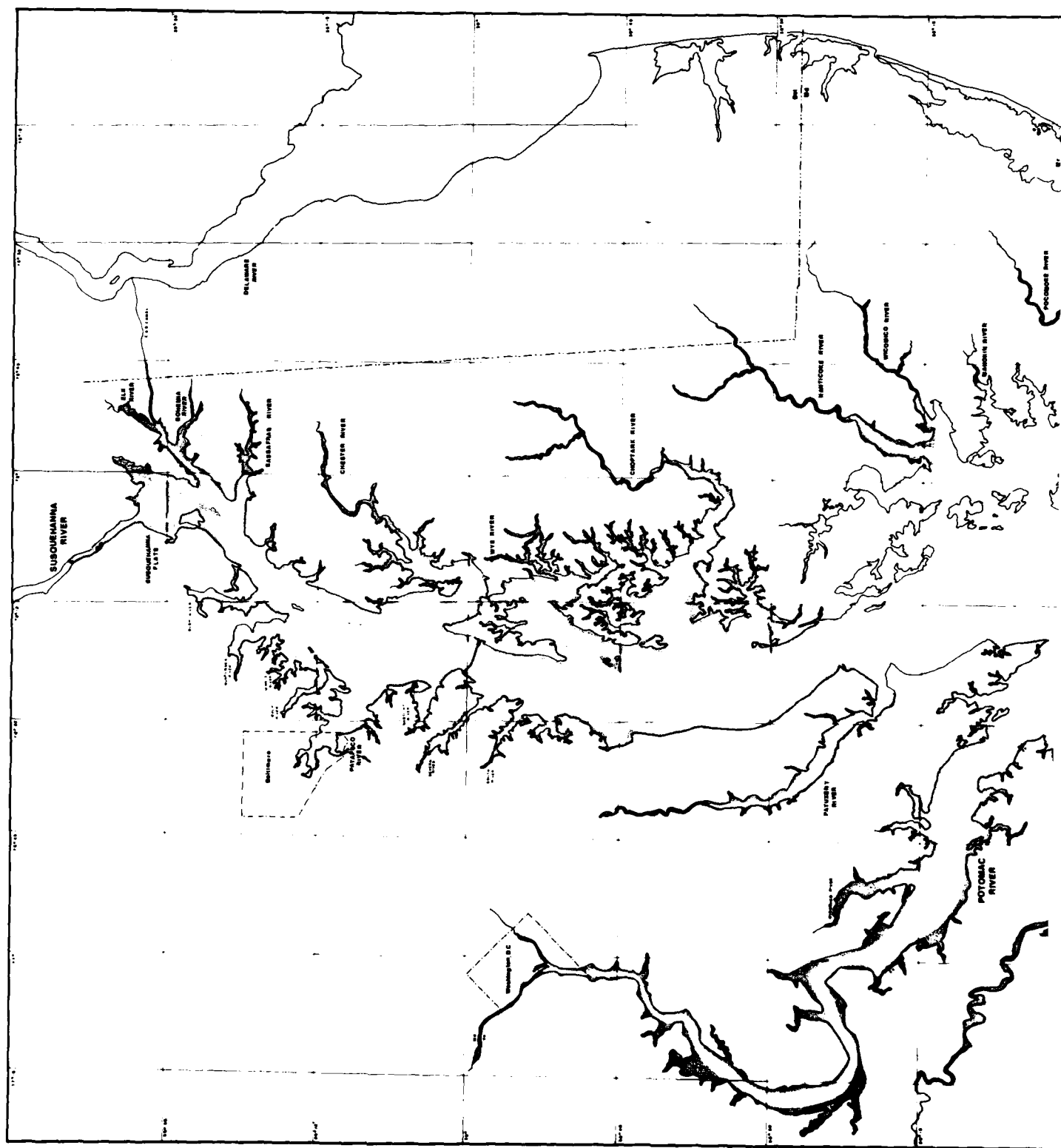
(1987-1991)

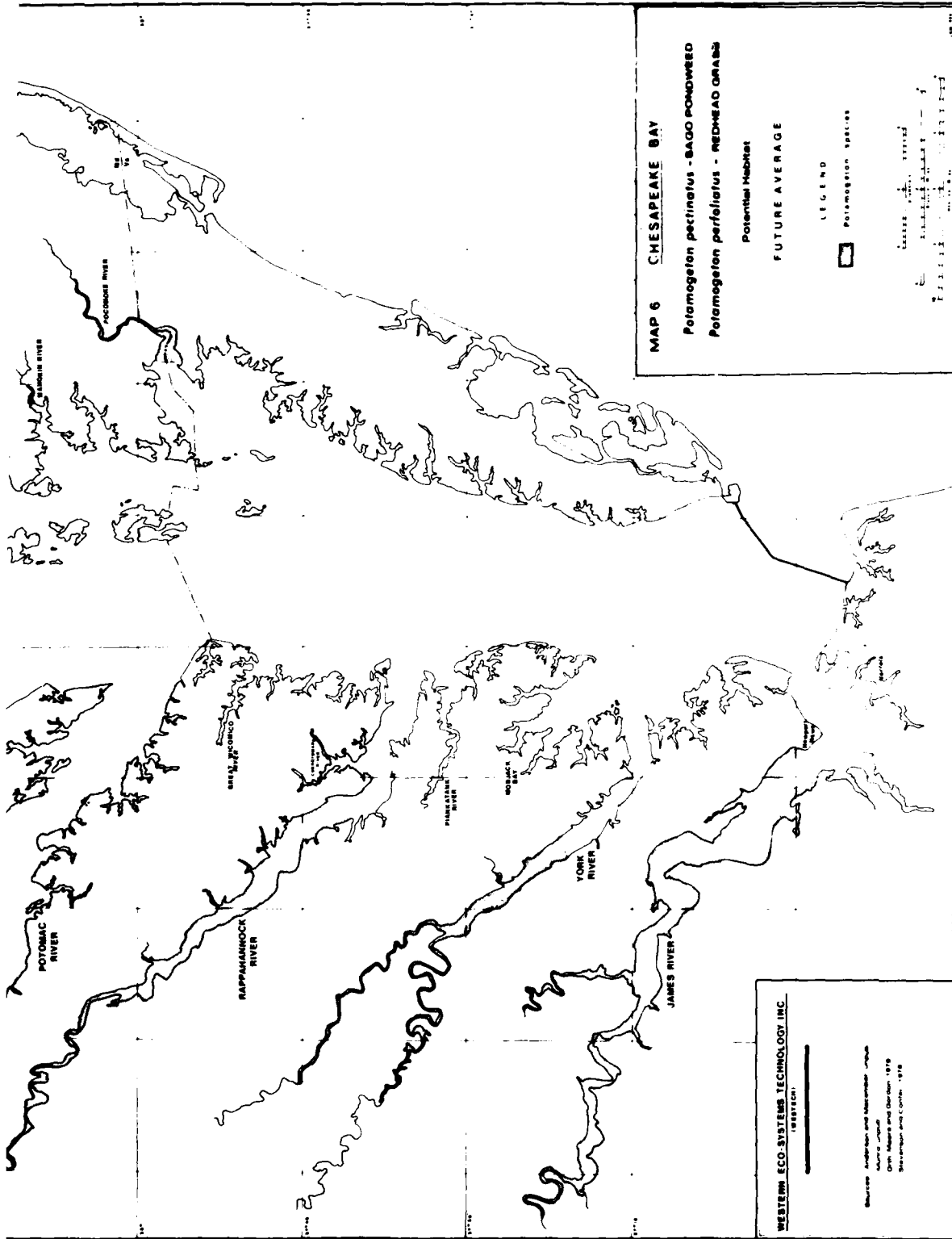
Revised: 1991 and 1992, 1993  
Maple and Oak, 1974  
Bass and Striped, 1975

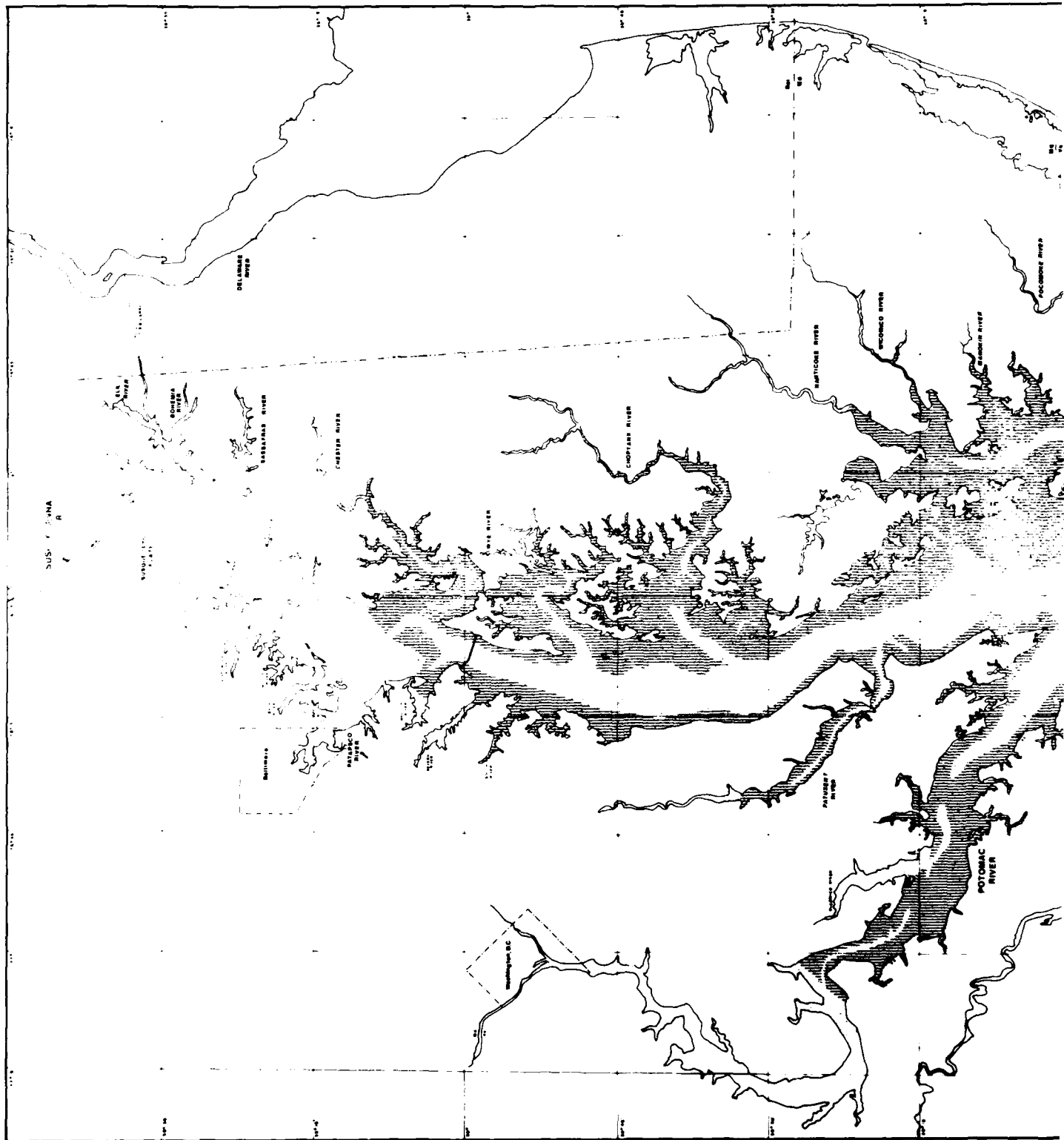


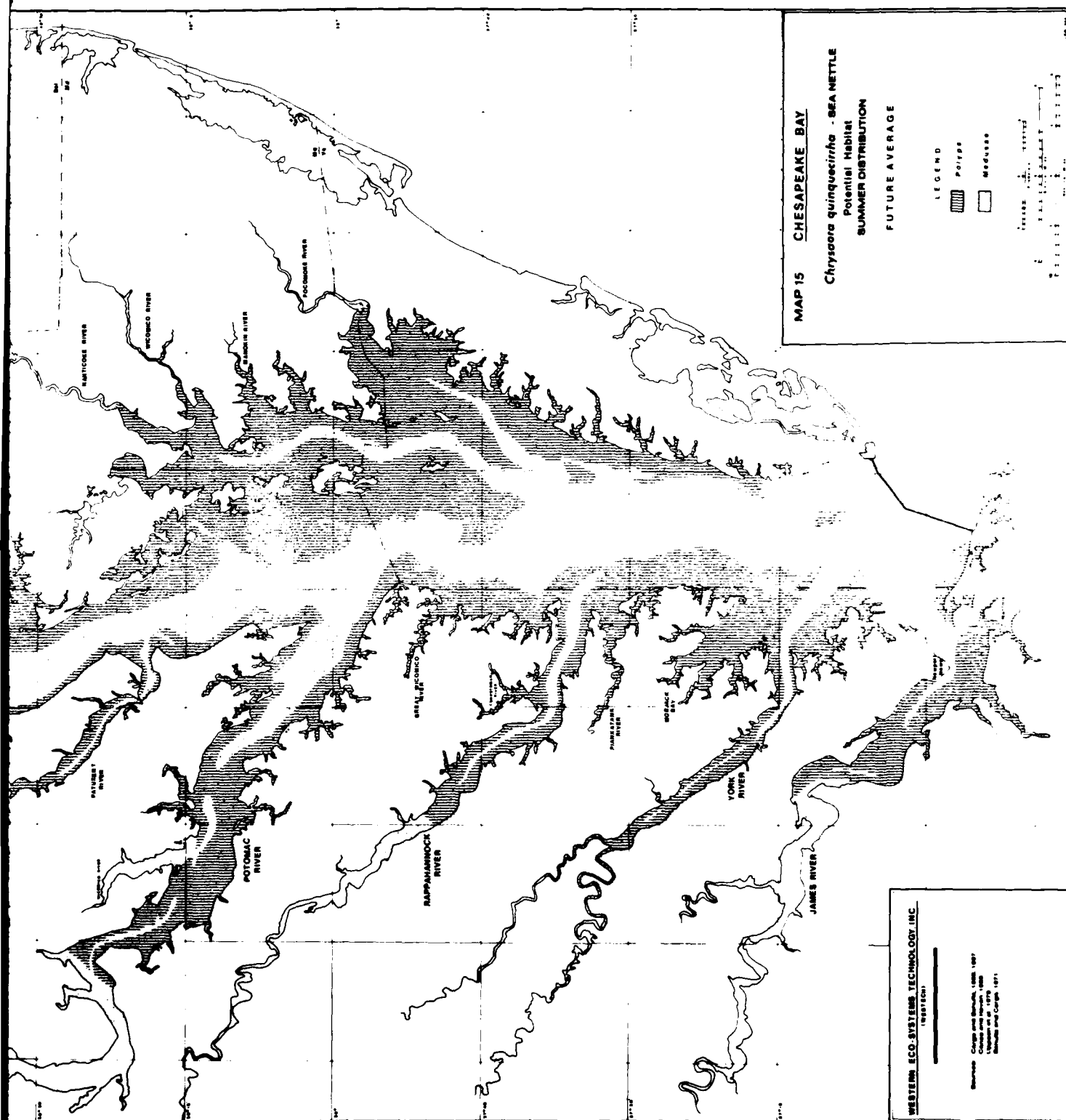












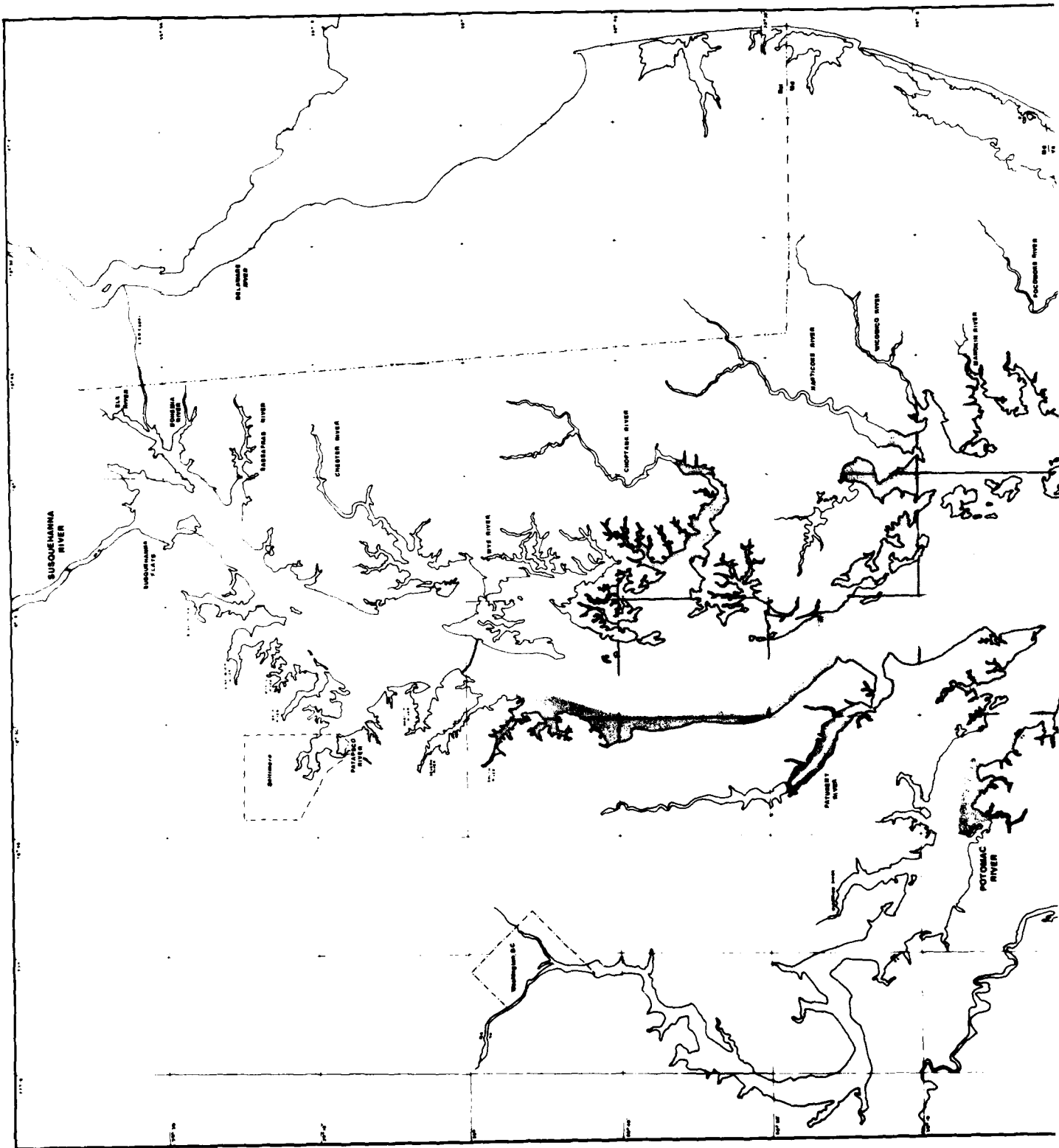
WESTERN ECO-SYSTEMS TECHNOLOGY, INC.

(continued)

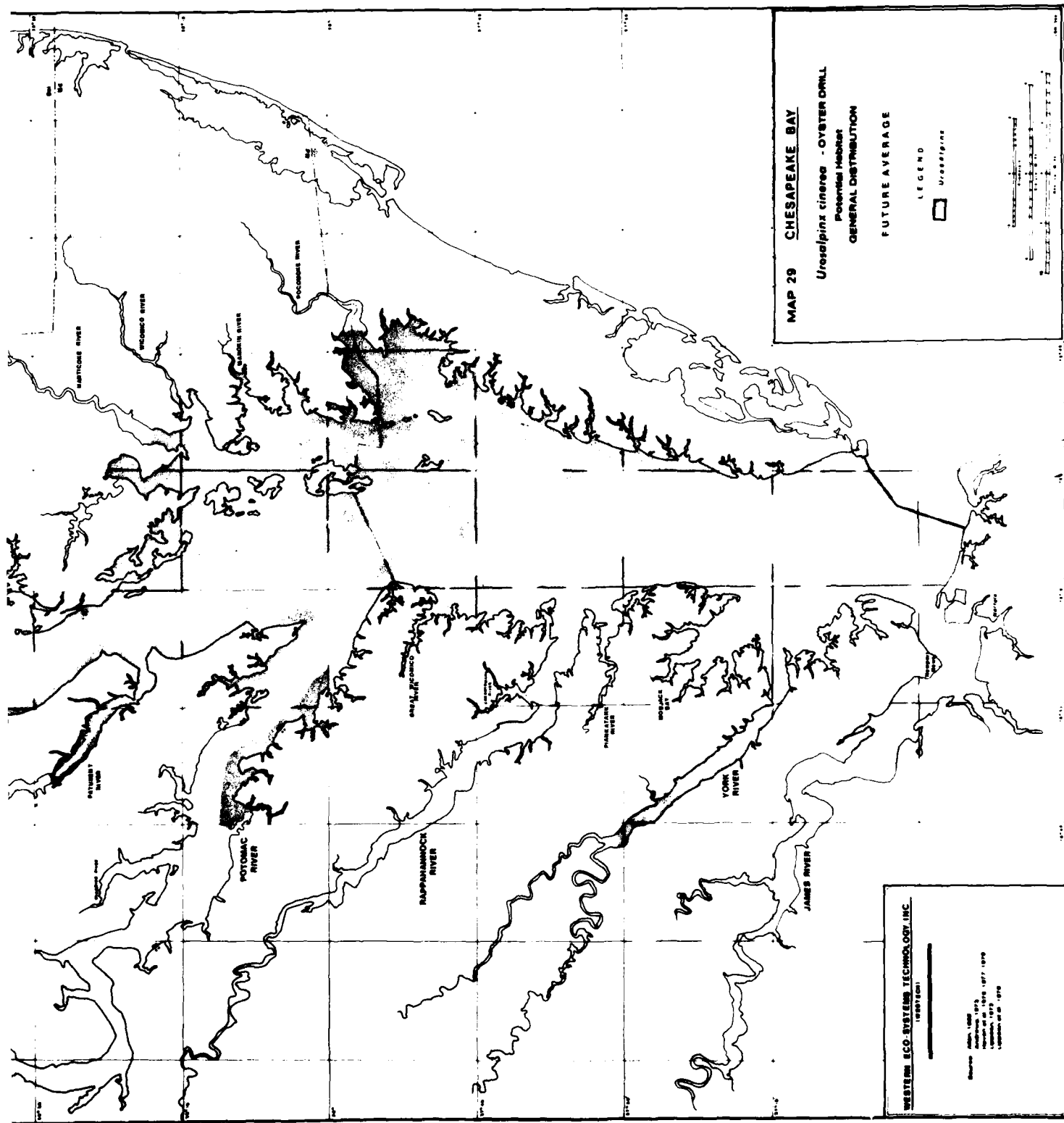
Source: Cope and Smith, 1987  
 Cope and Smith, 1988  
 Cope and Smith, 1989  
 Cope and Smith, 1990  
 Cope and Smith, 1991

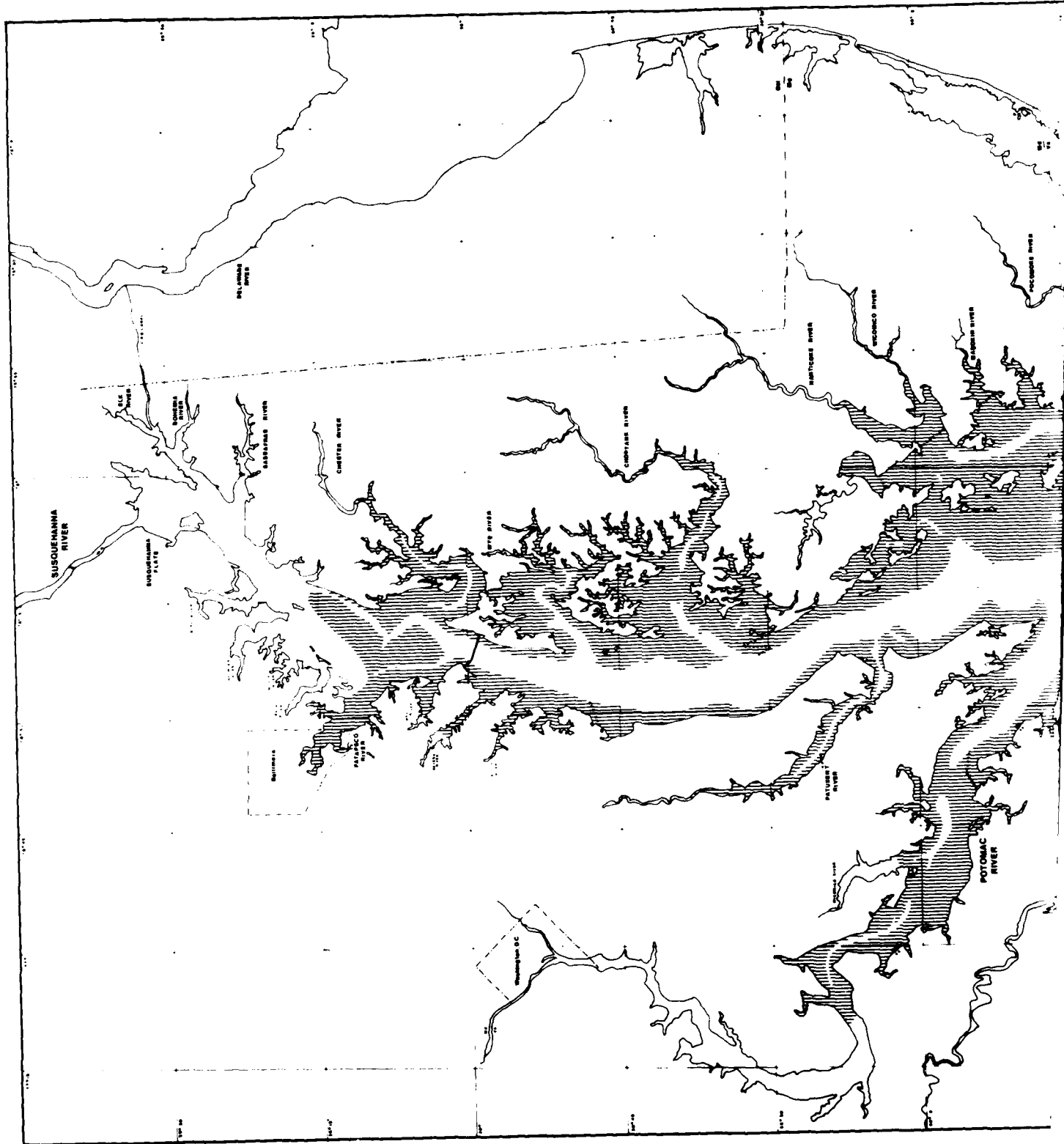


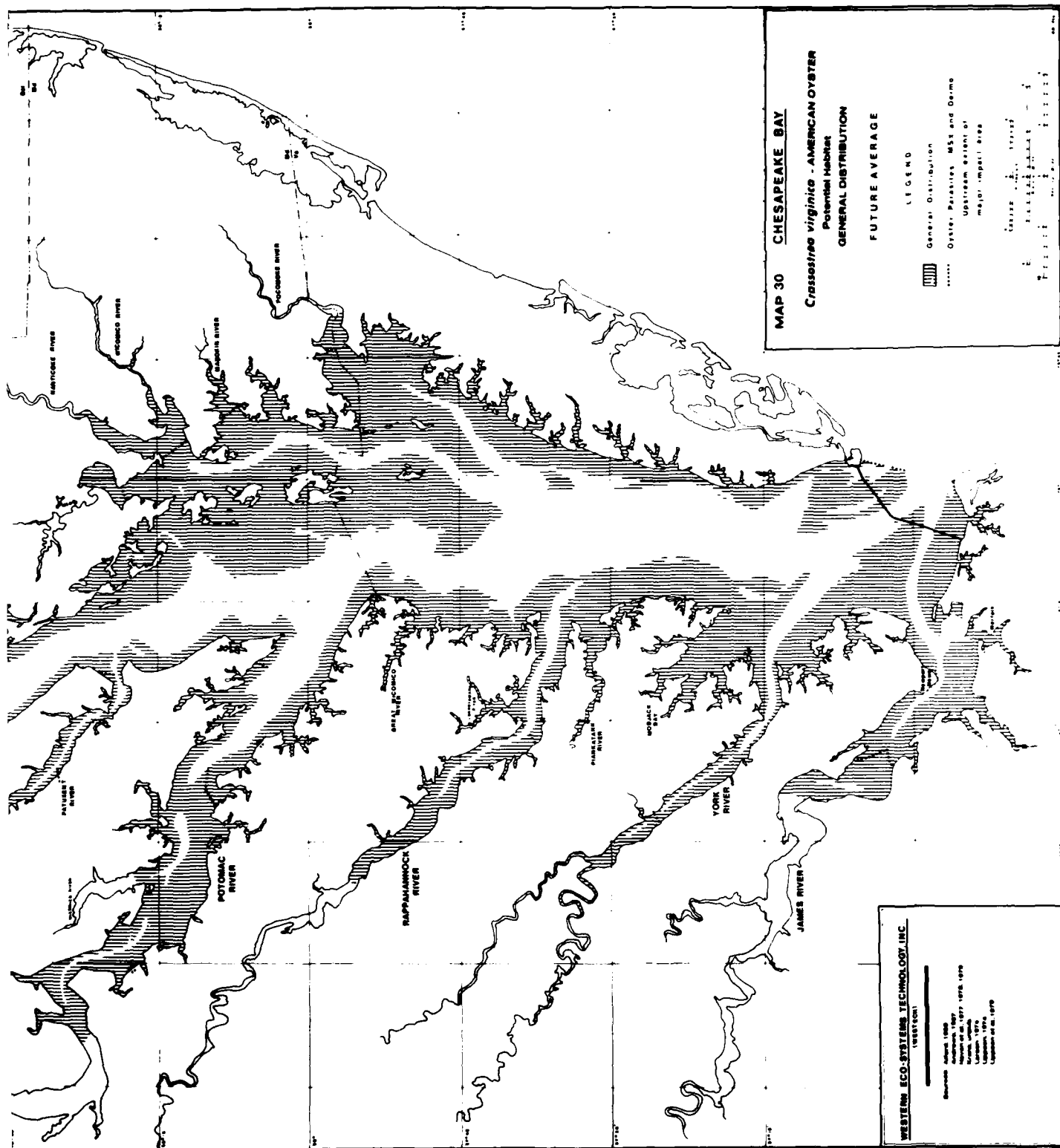


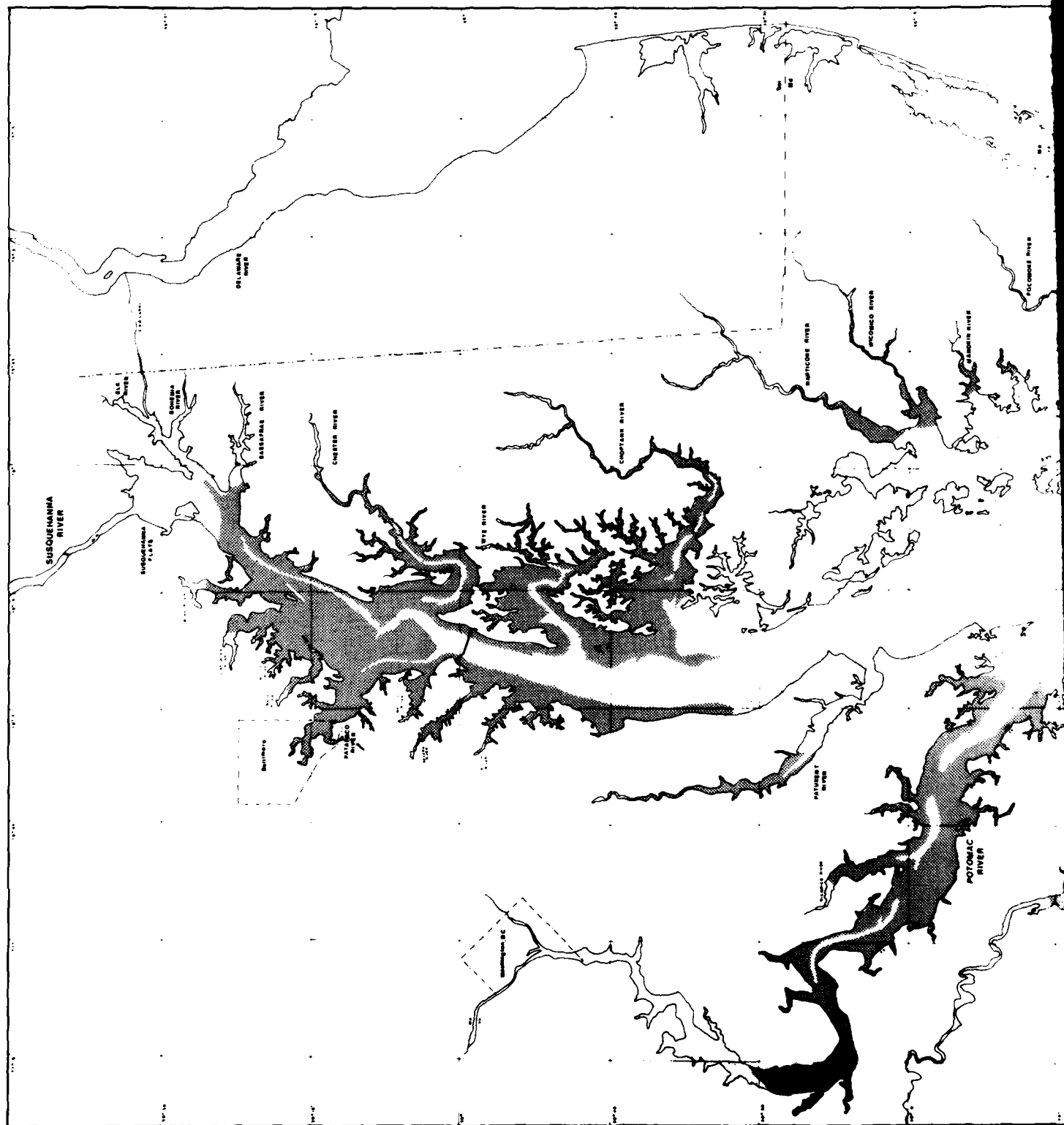




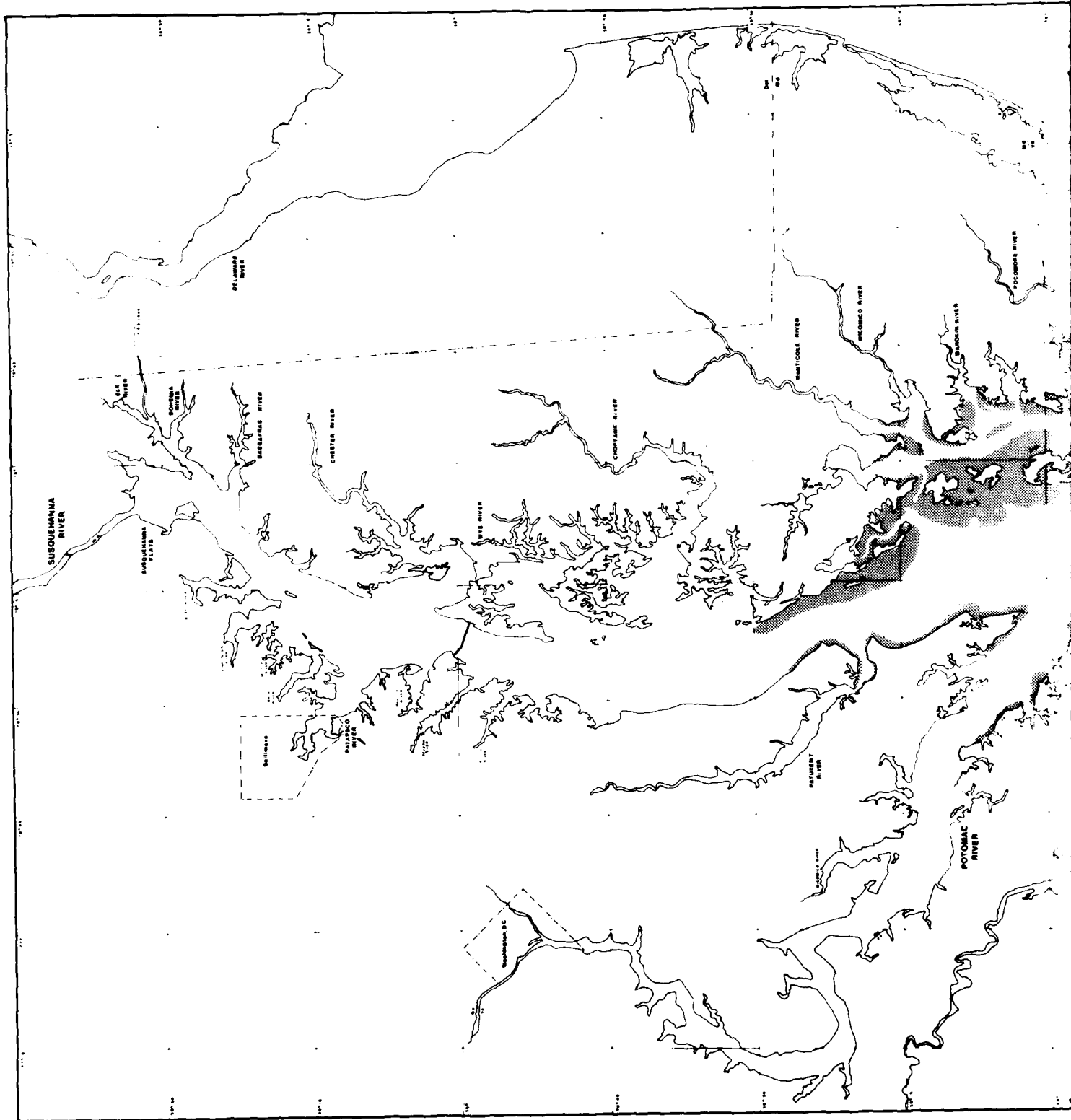


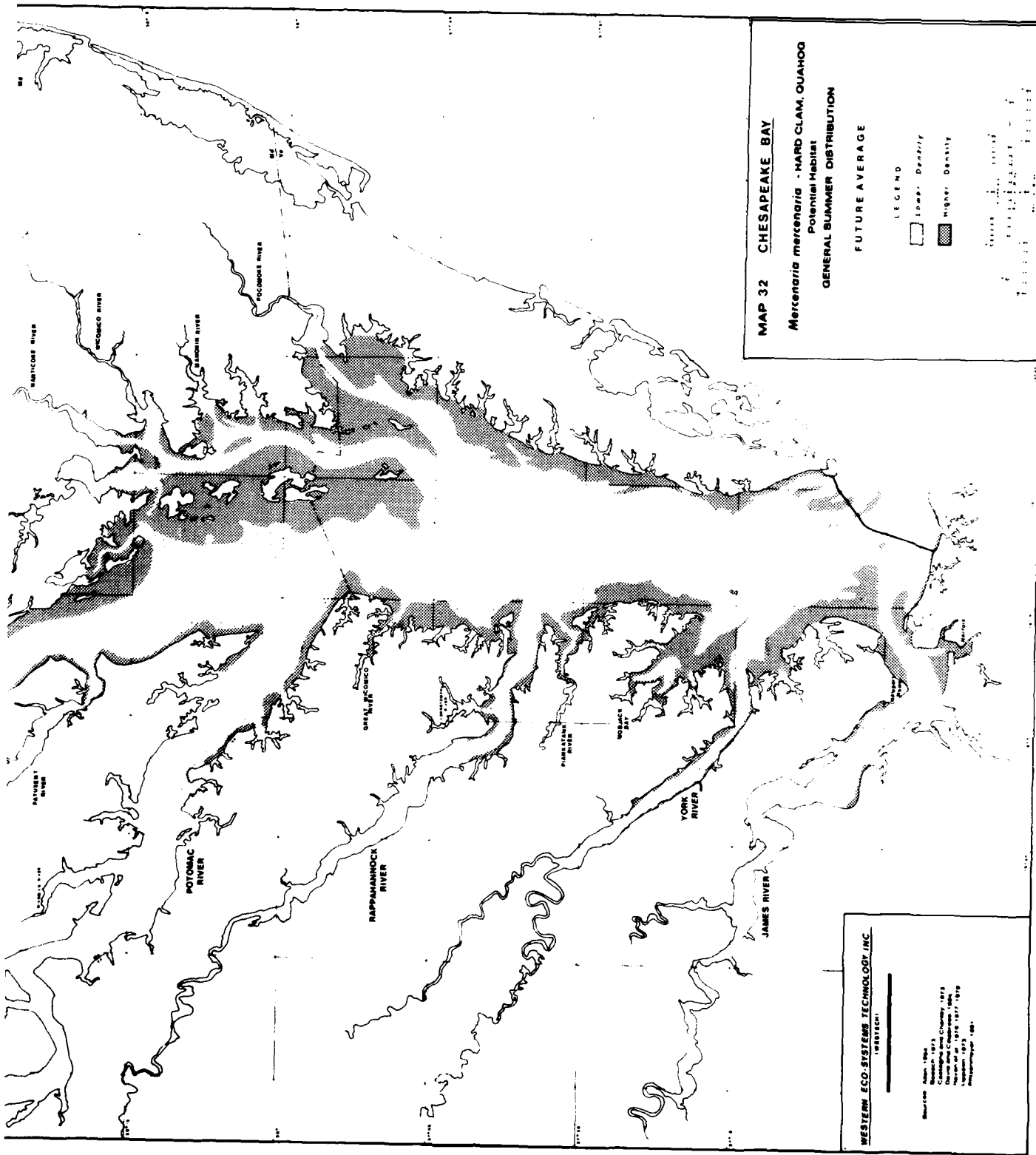


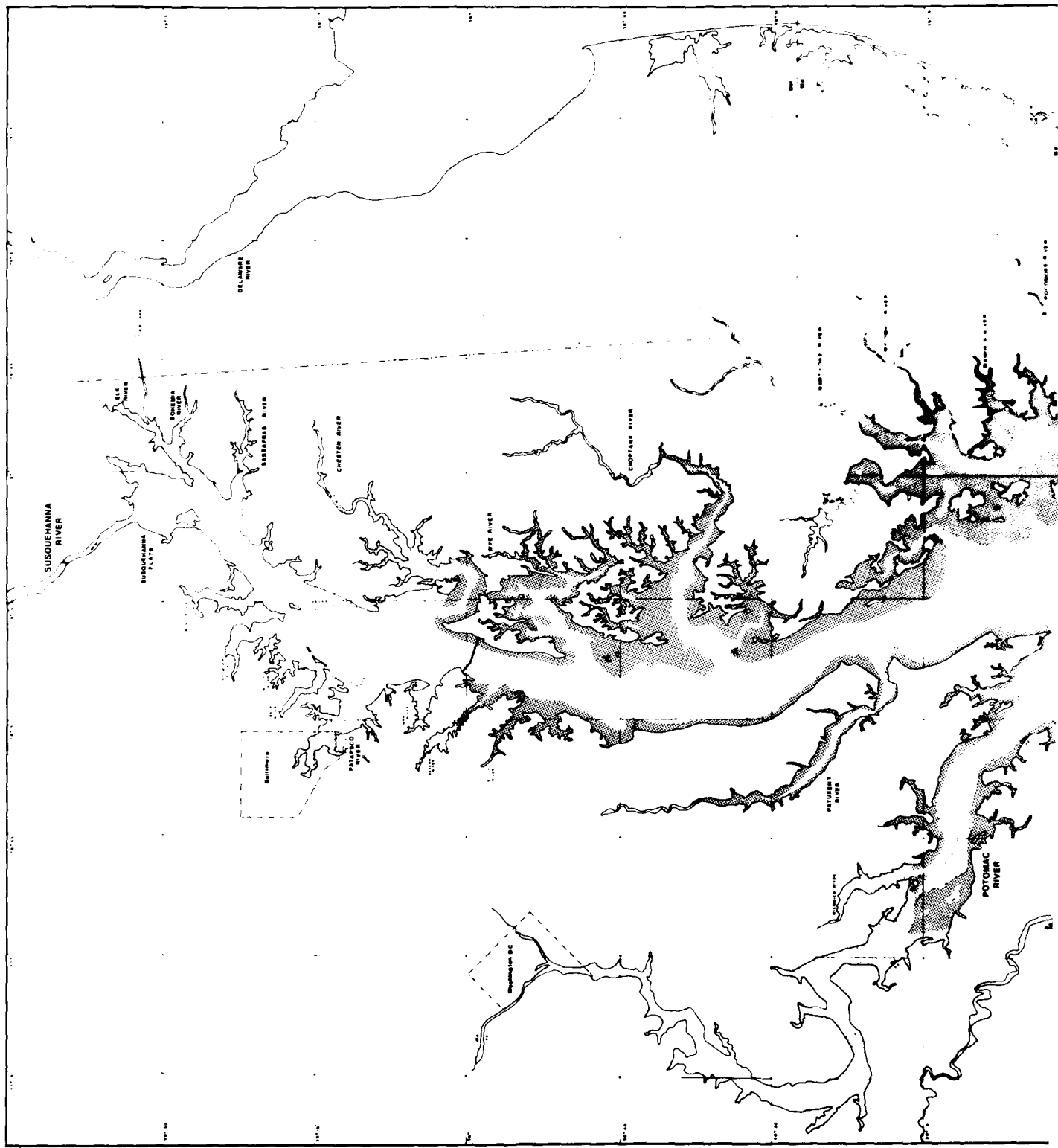




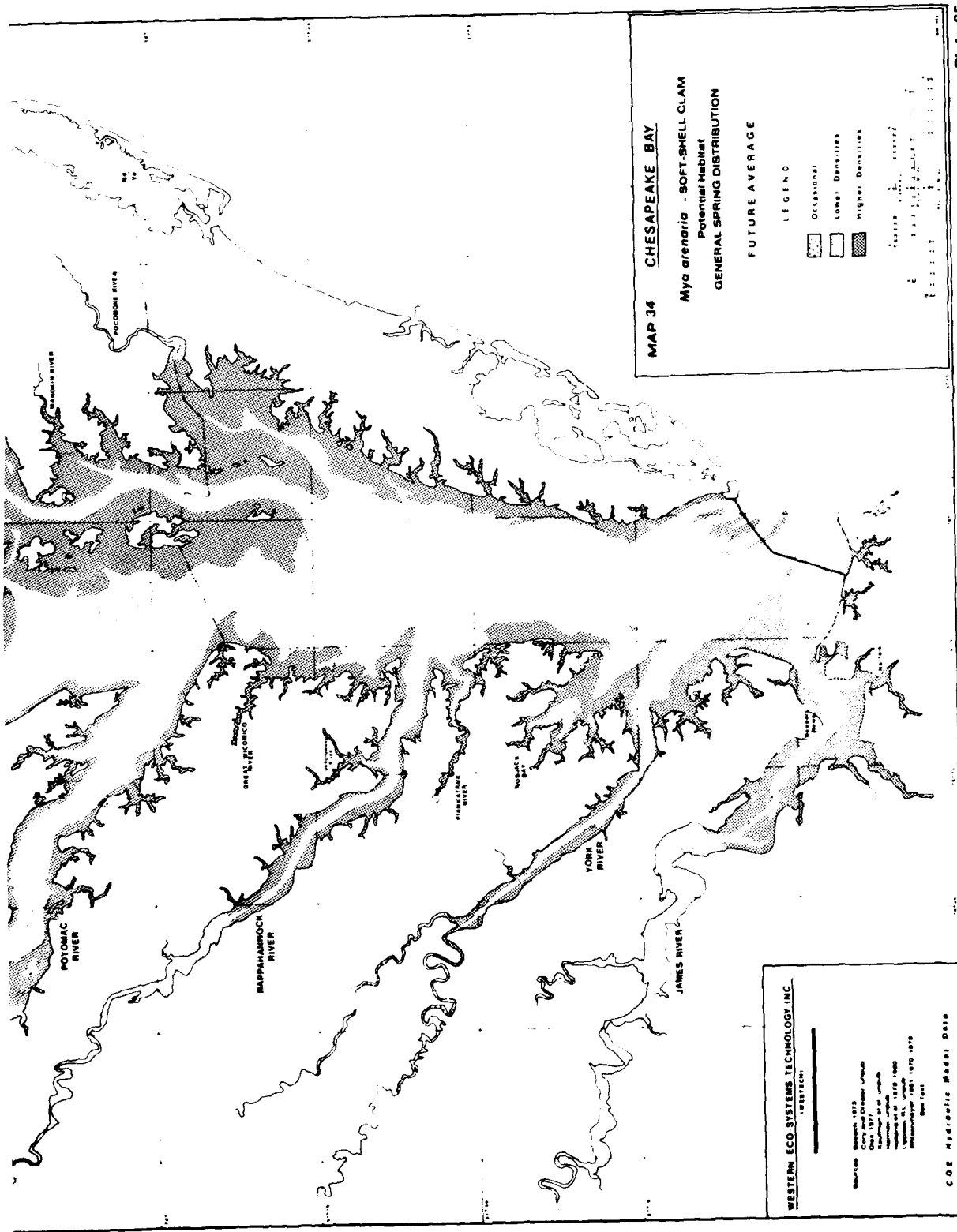


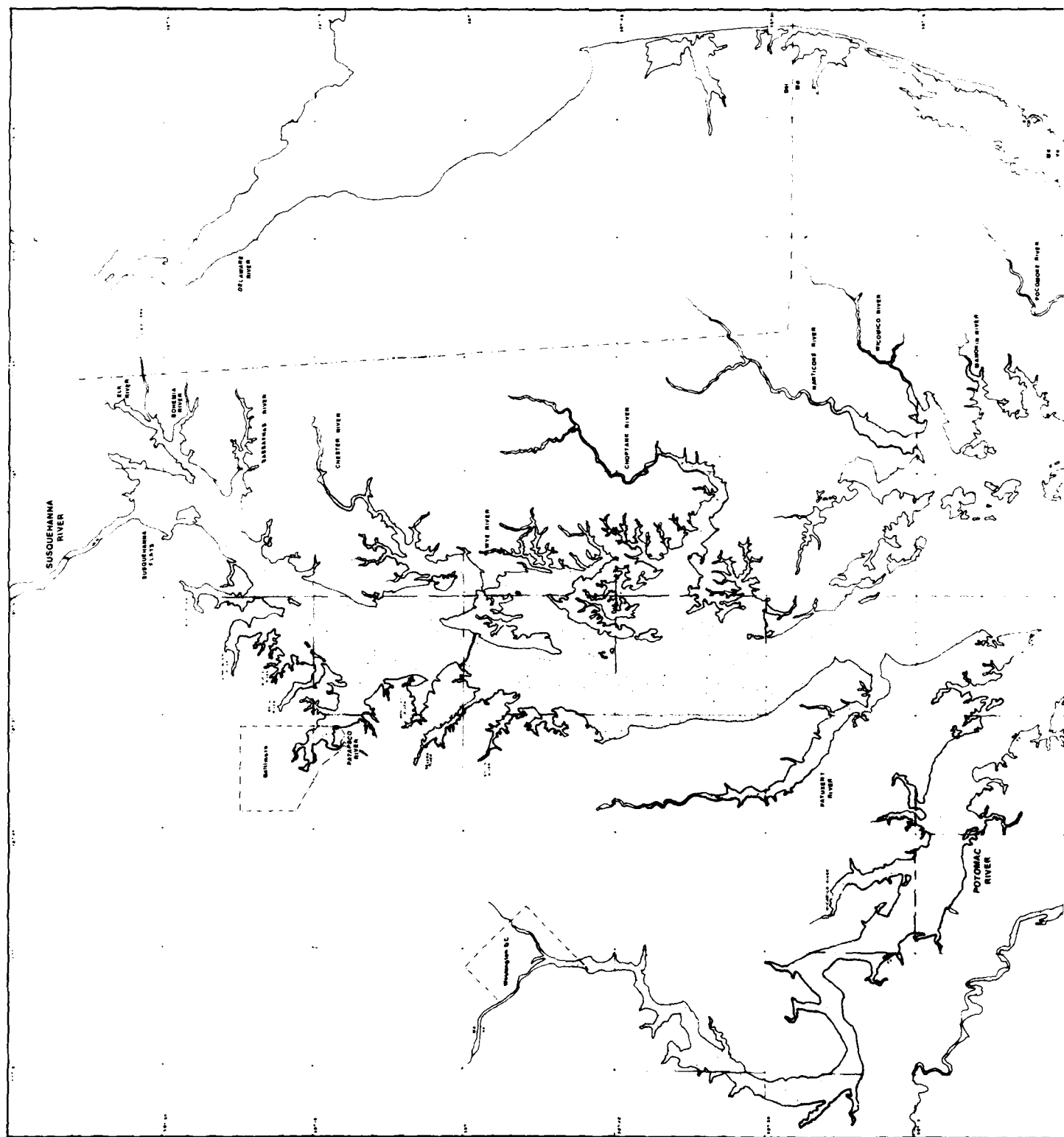




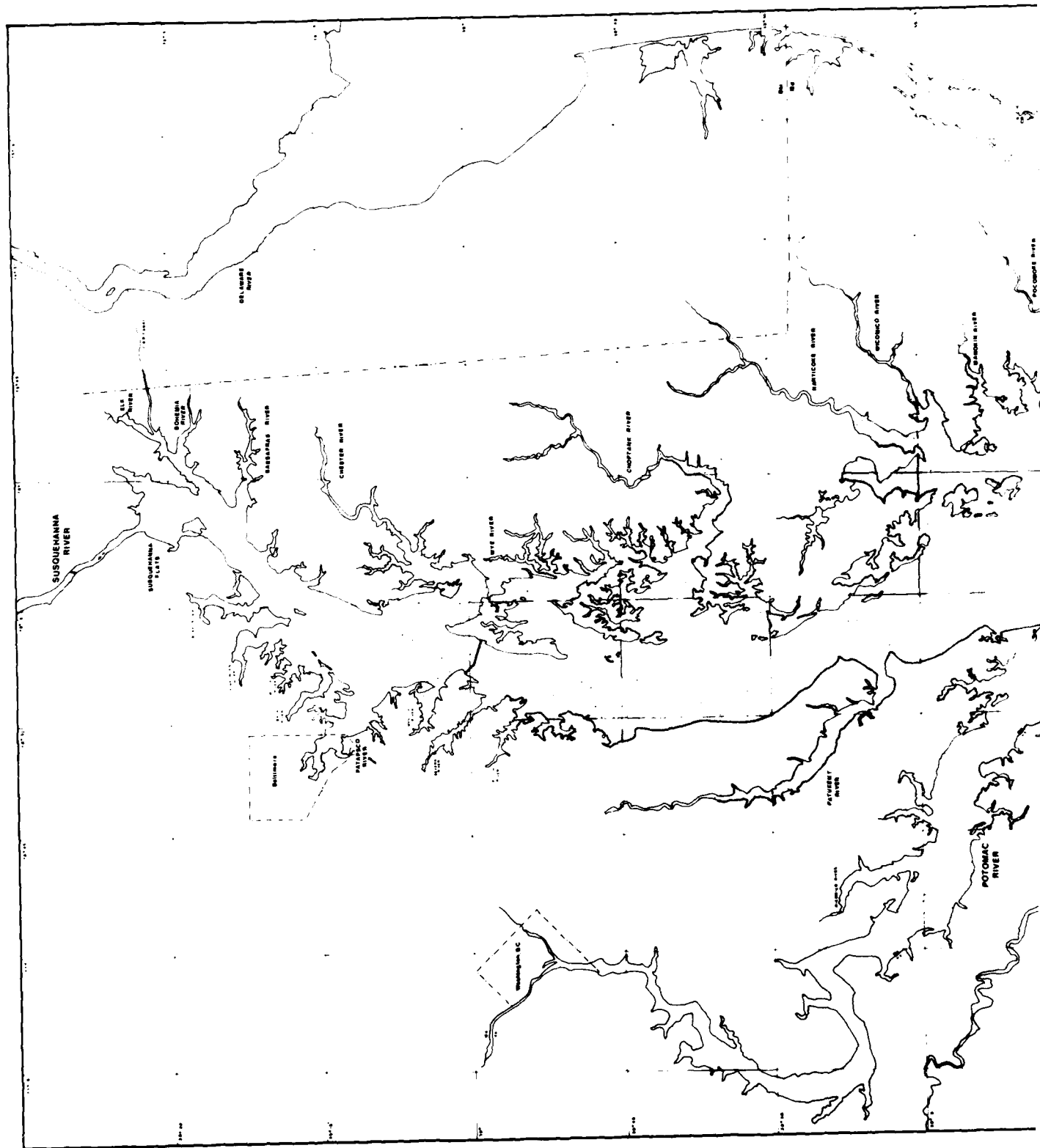


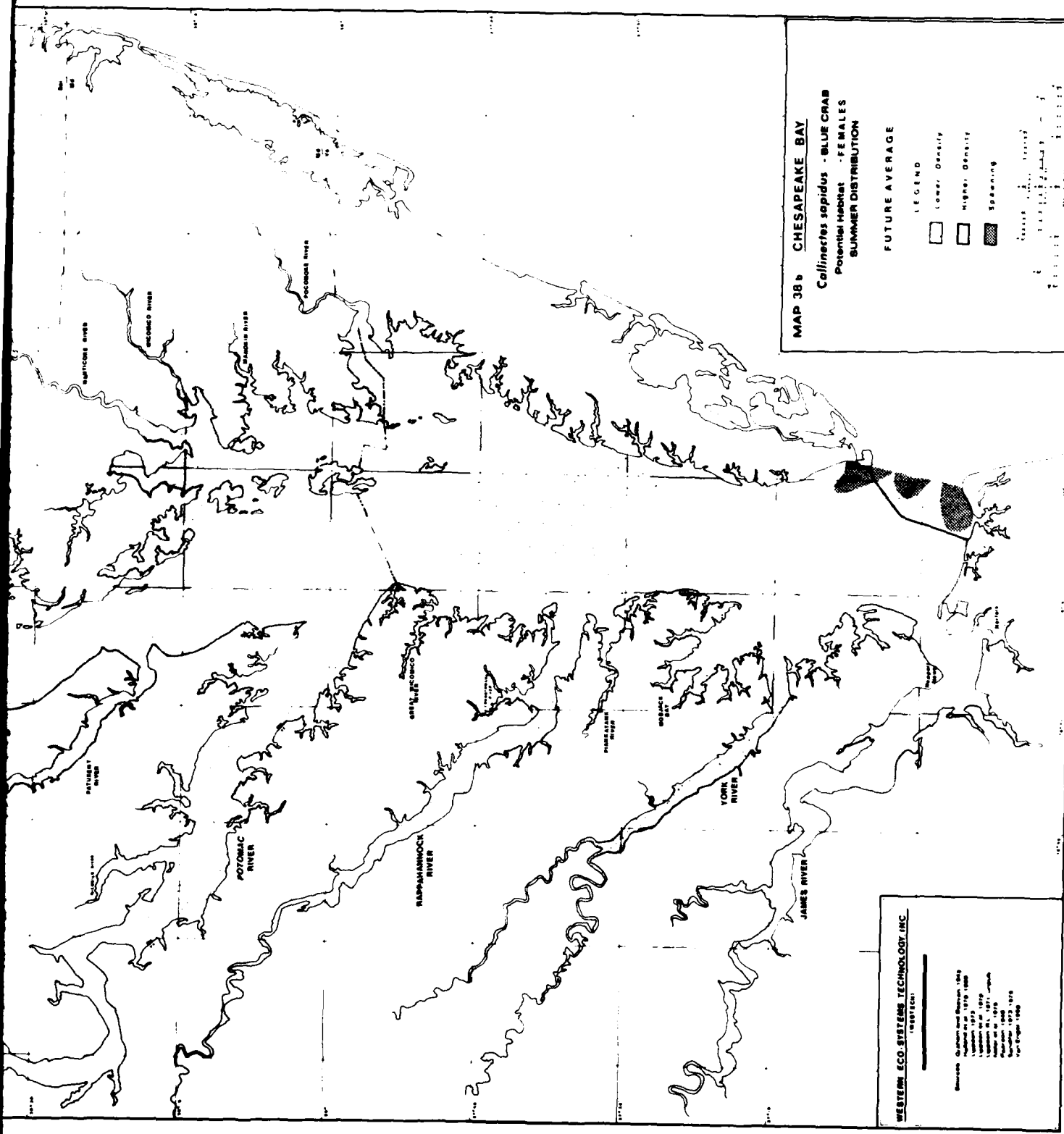












**MAP 38b CHESAPEAKE BAY**  
*Callinectes sapidus* - BLUE CRAB  
 Potential Habitat - FE MALES  
 SUMMER DISTRIBUTION

**FUTURE AVERAGE**

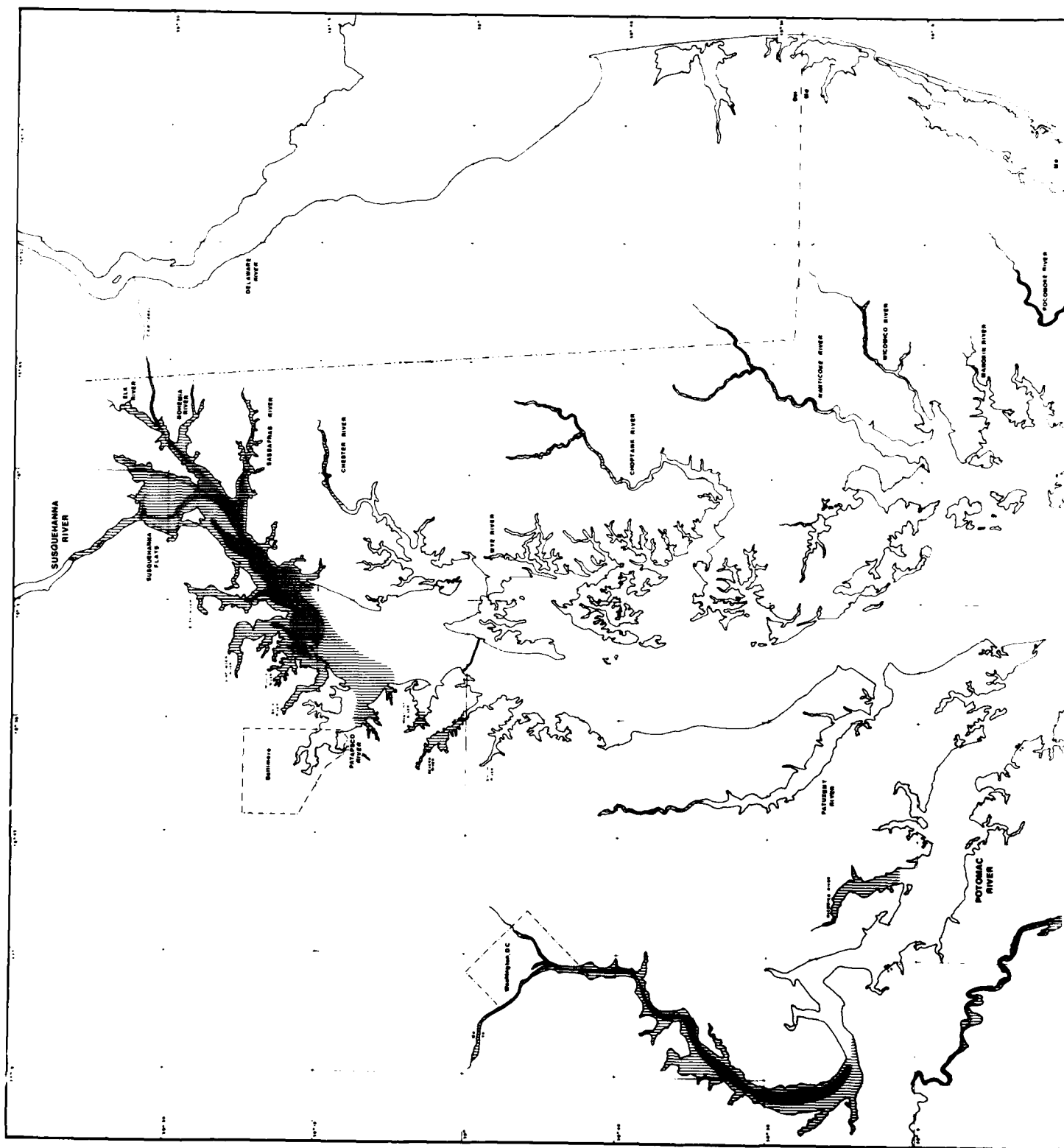
**LEGEND**

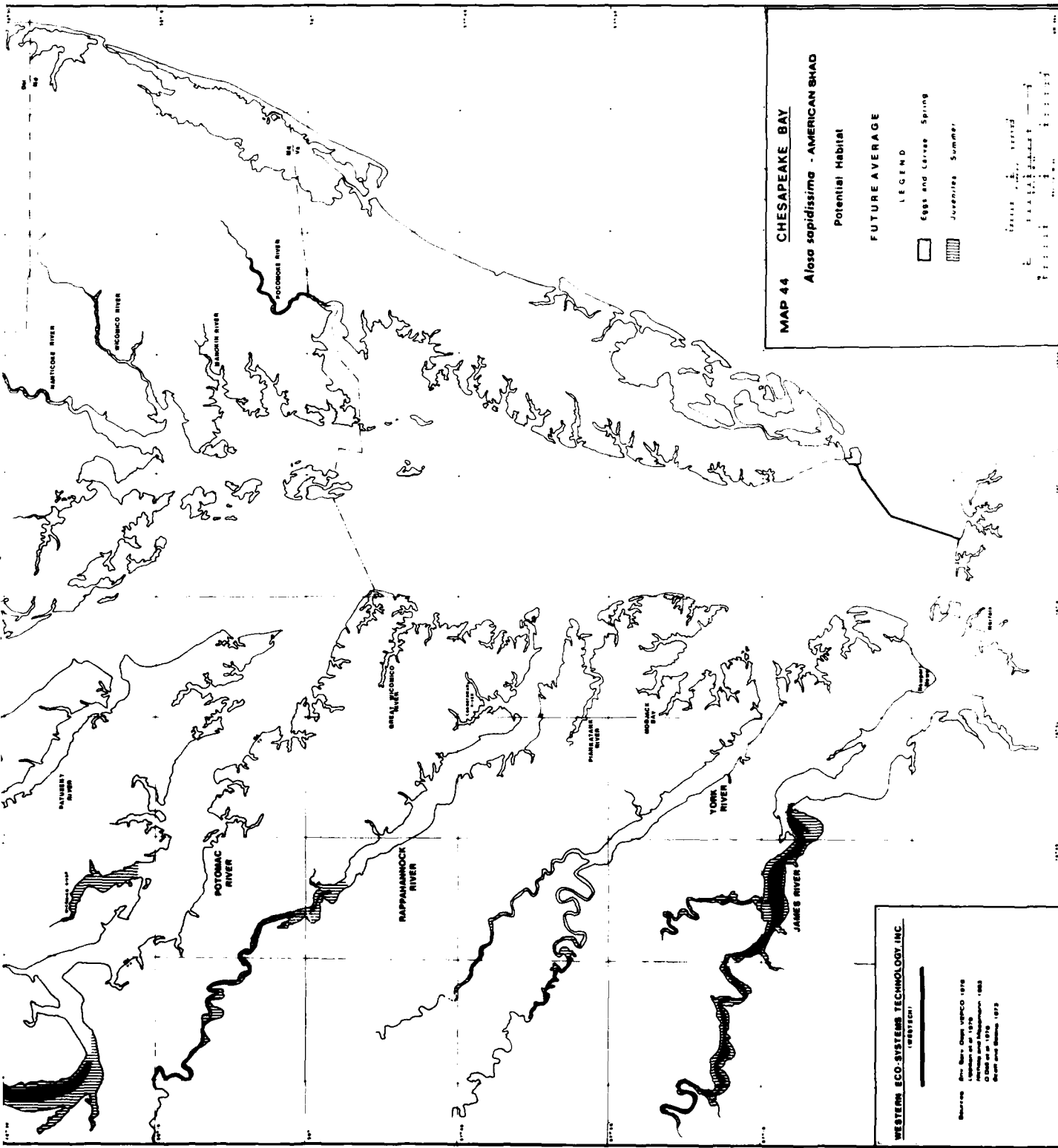
Lower Density  
 Higher Density  
 Spawning

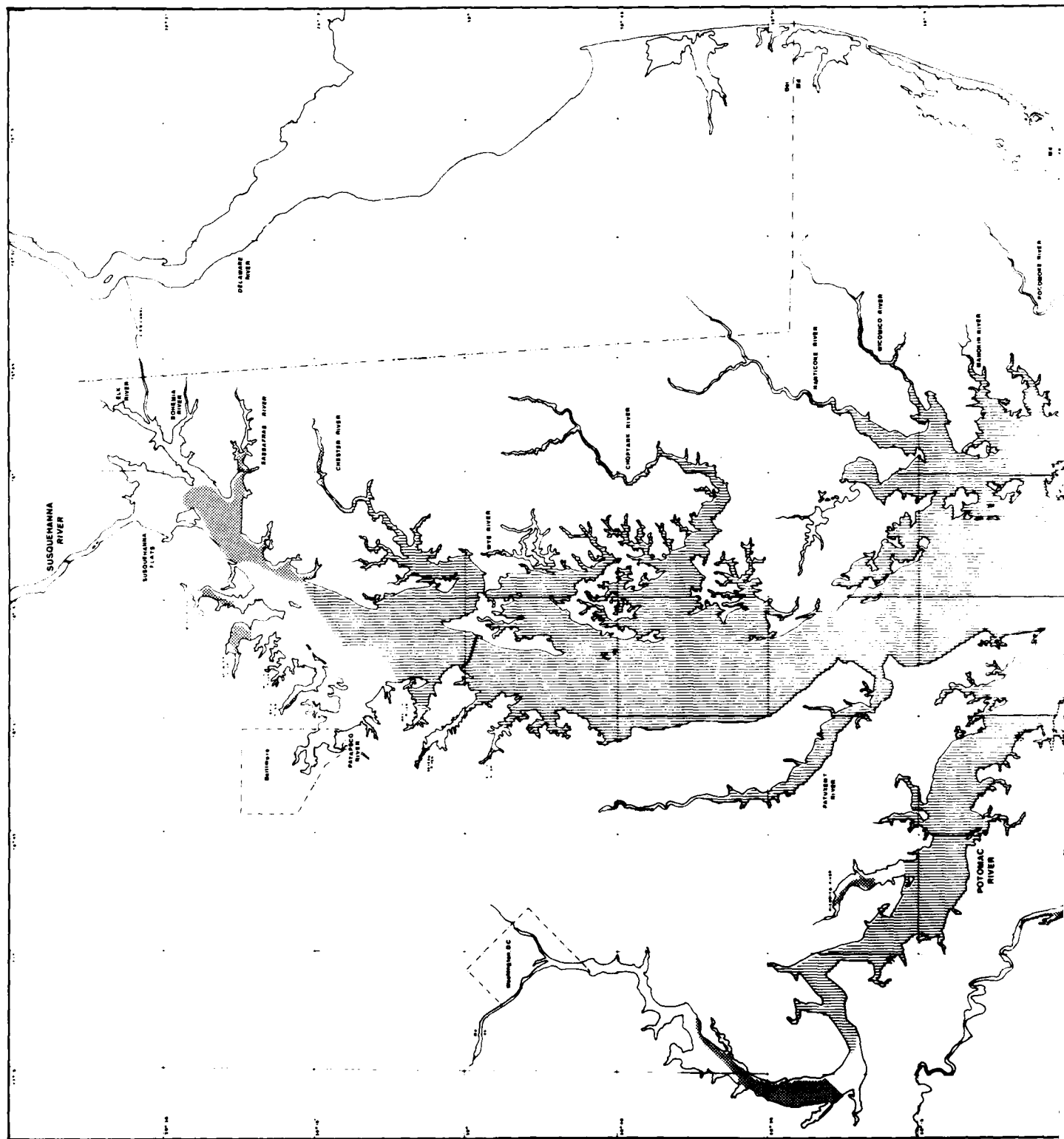
Scale: 0 10 20 Miles  
 0 10 20 Kilometers

**WESTERN ECO-SYSTEMS TECHNOLOGY, INC.**  
 WEST ECT

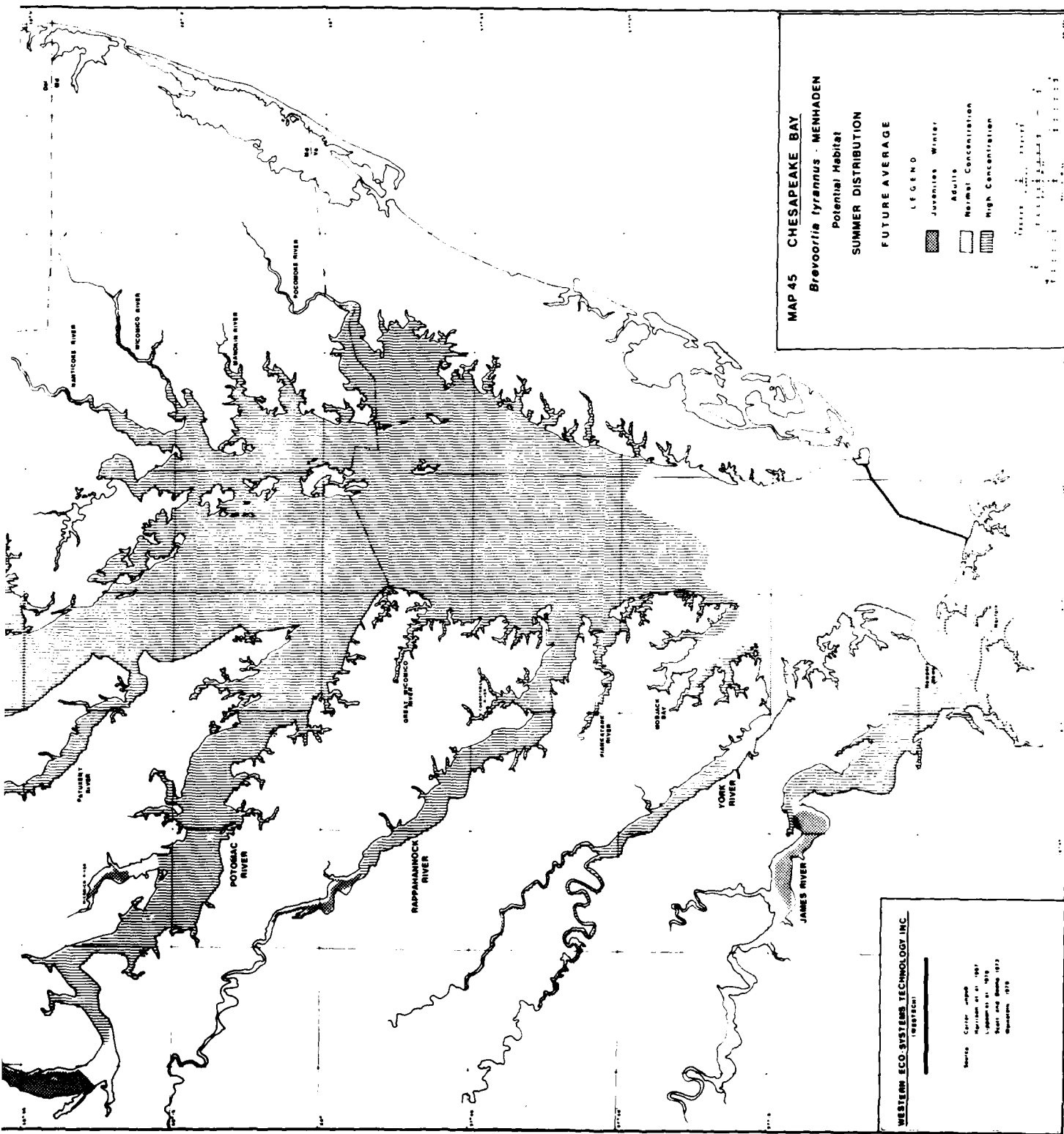
Developed: Hampton and Williams, 1982  
 Modified by: J. W. Williams, 1982  
 Modified by: J. W. Williams, 1982  
 Modified by: J. W. Williams, 1982  
 Modified by: J. W. Williams, 1982  
 Modified by: J. W. Williams, 1982

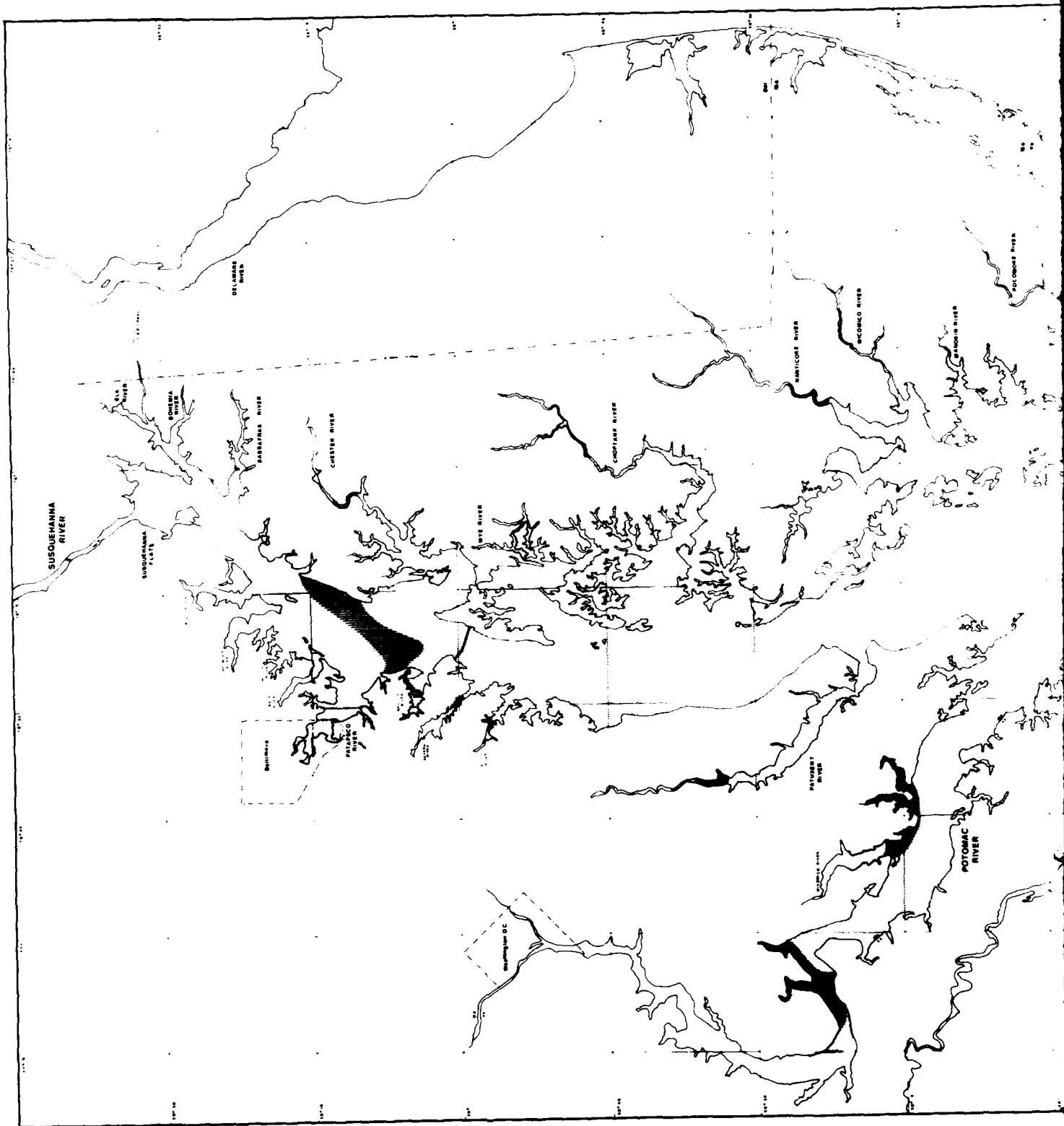


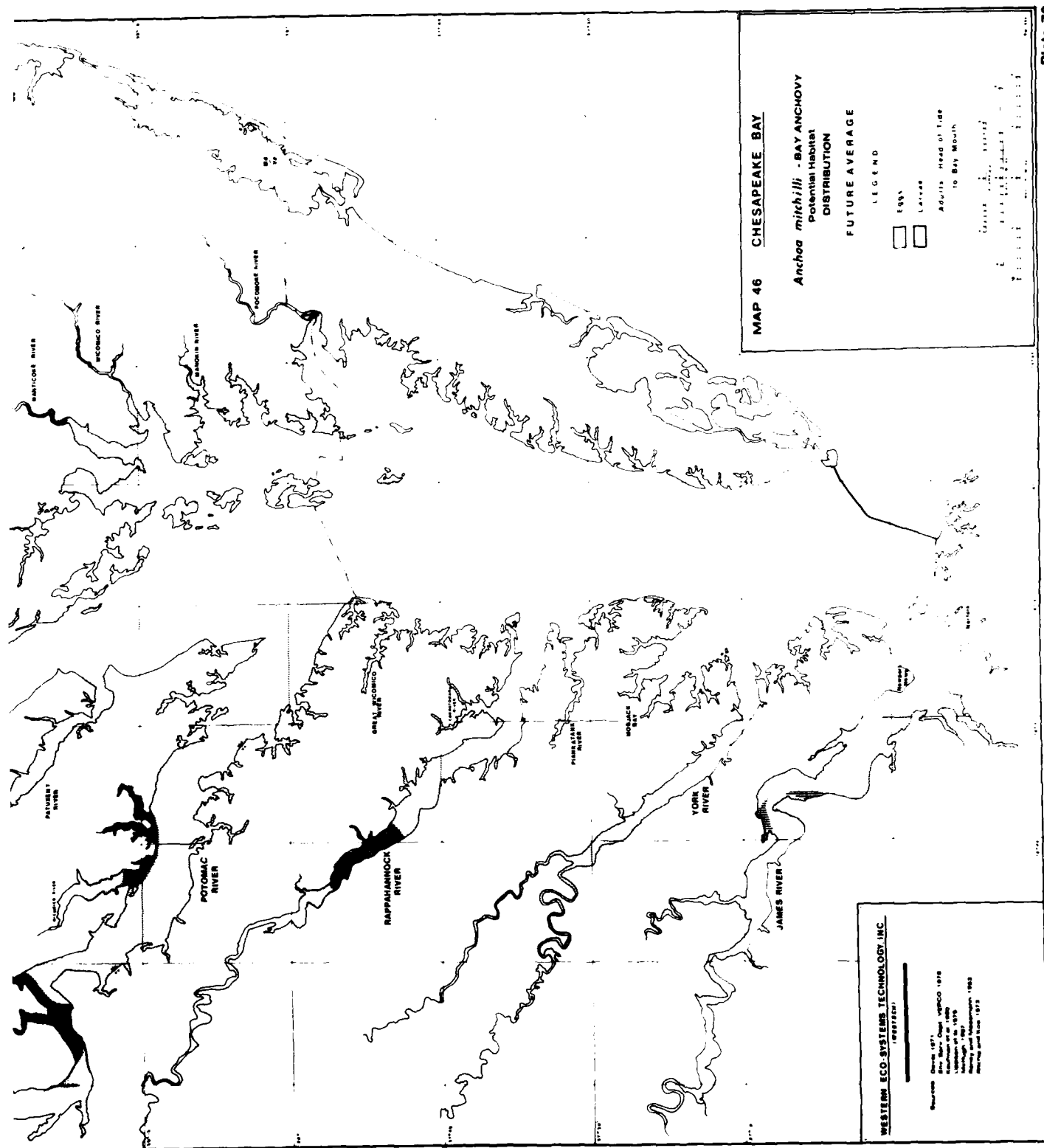


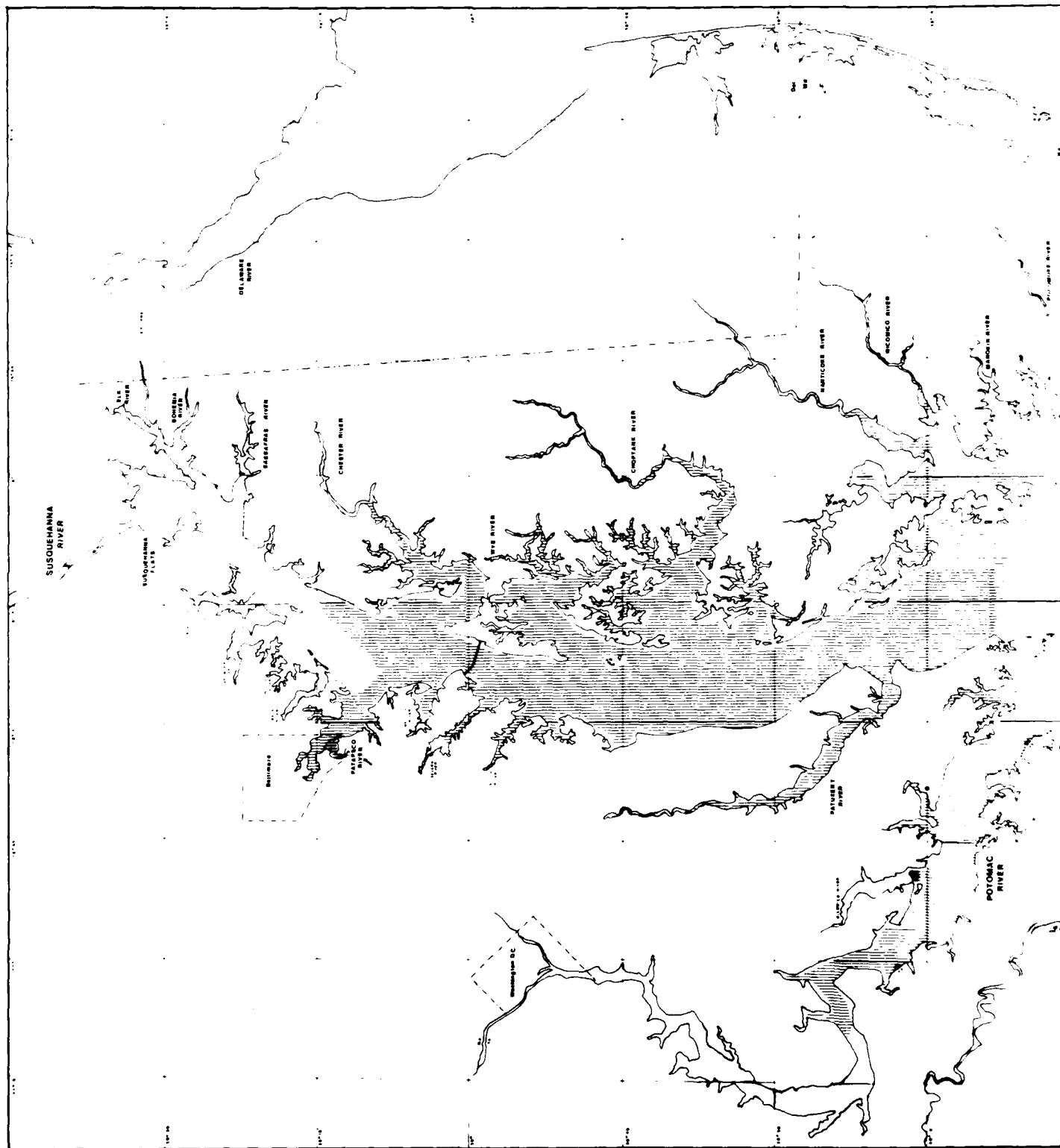


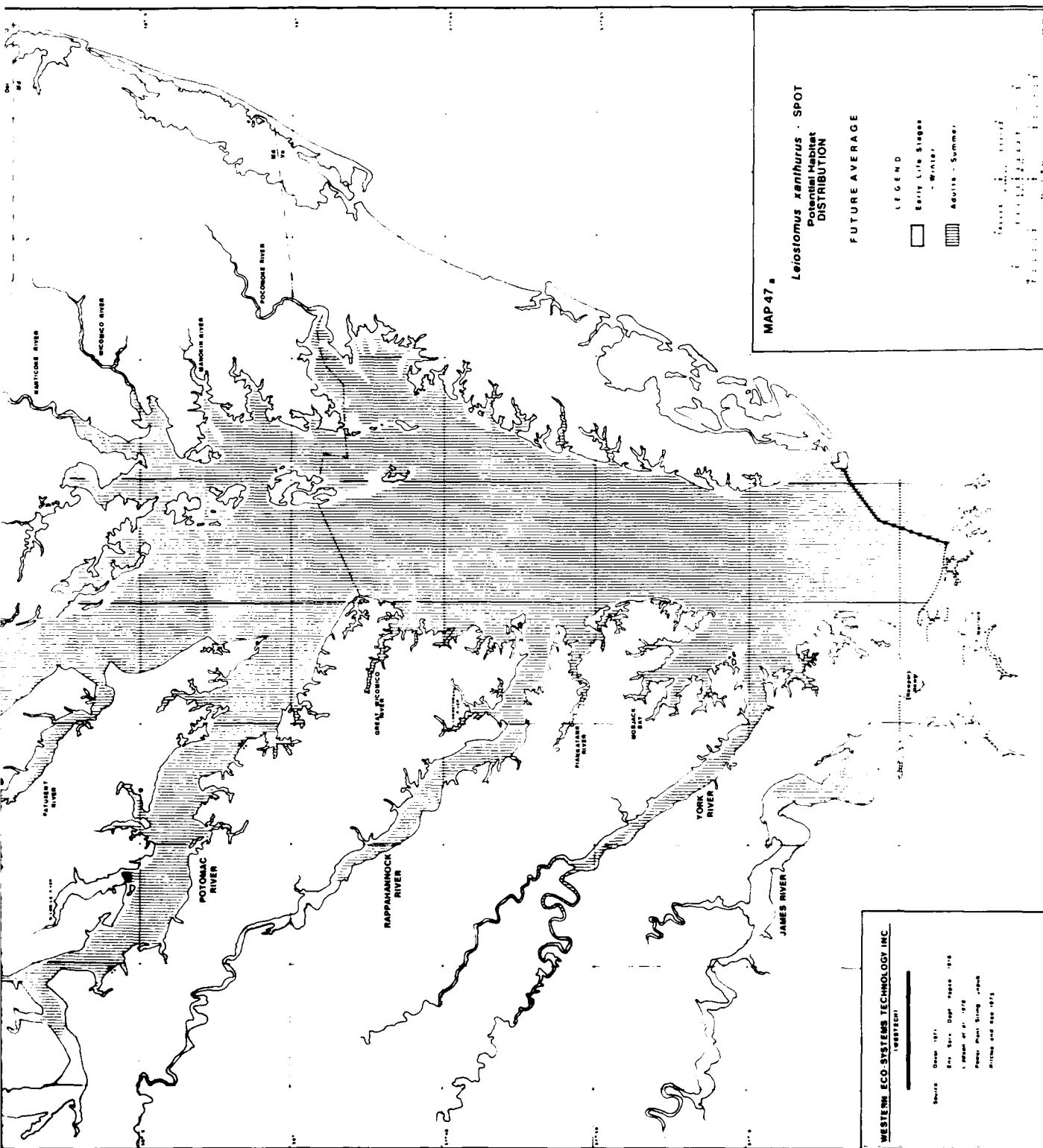


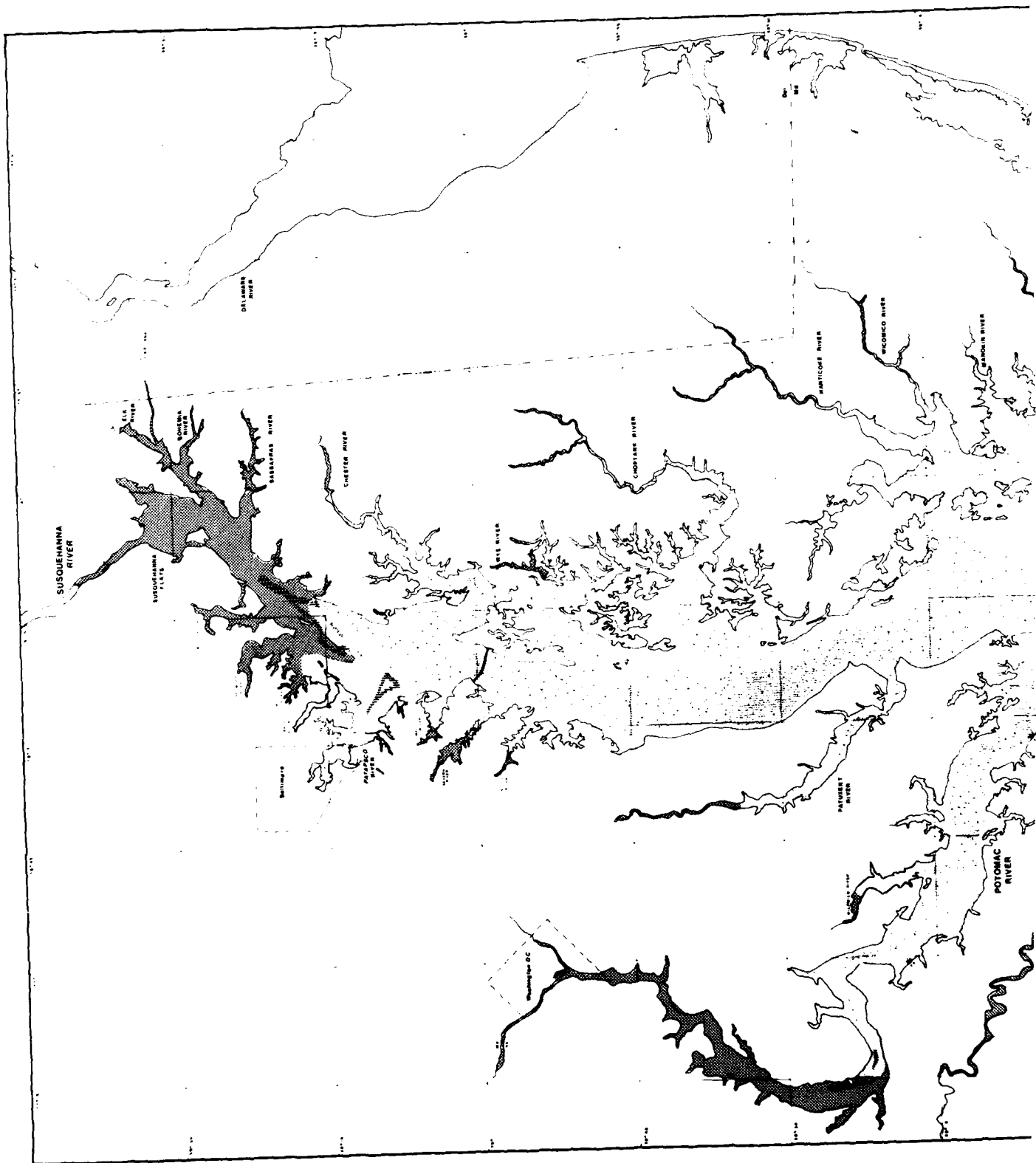


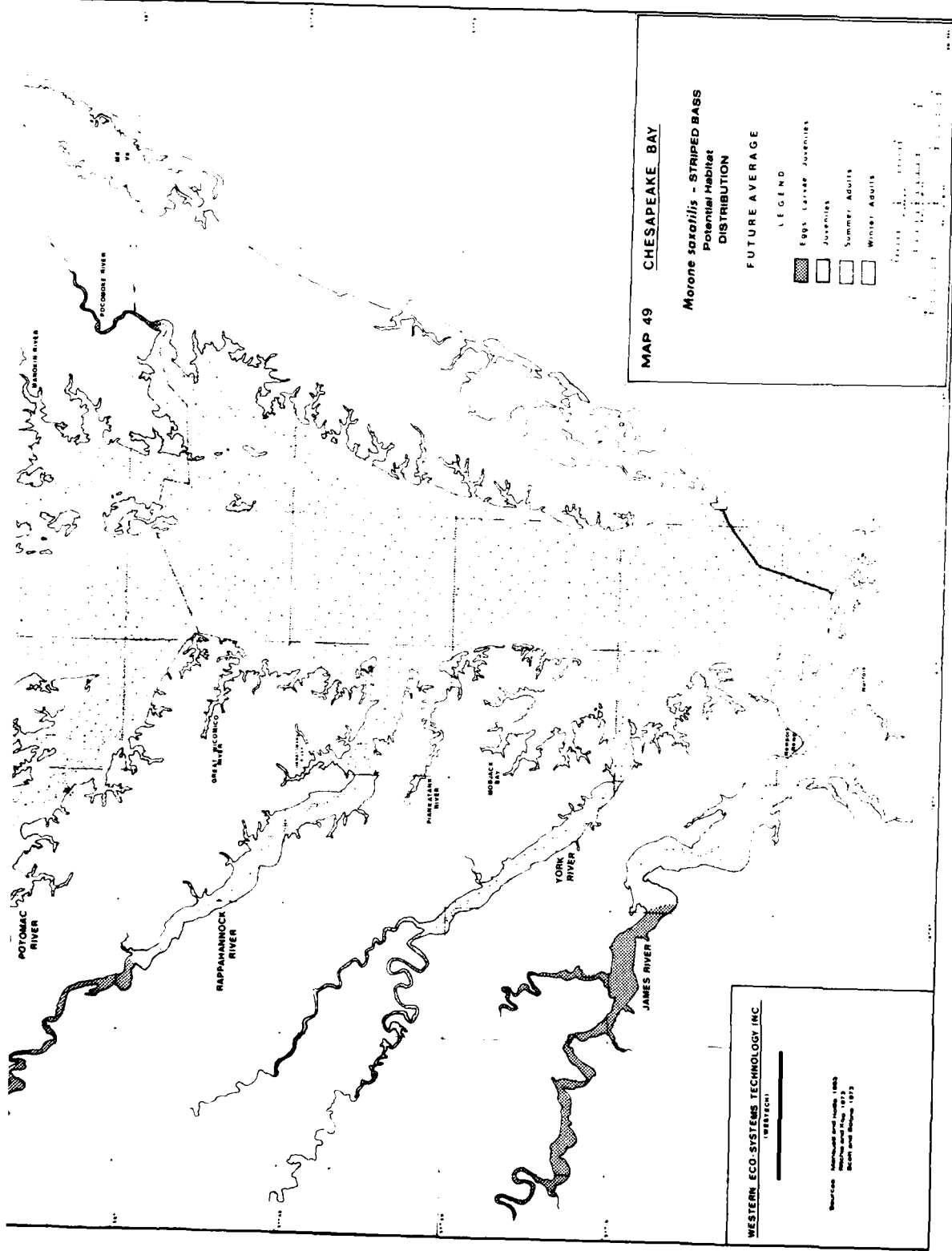


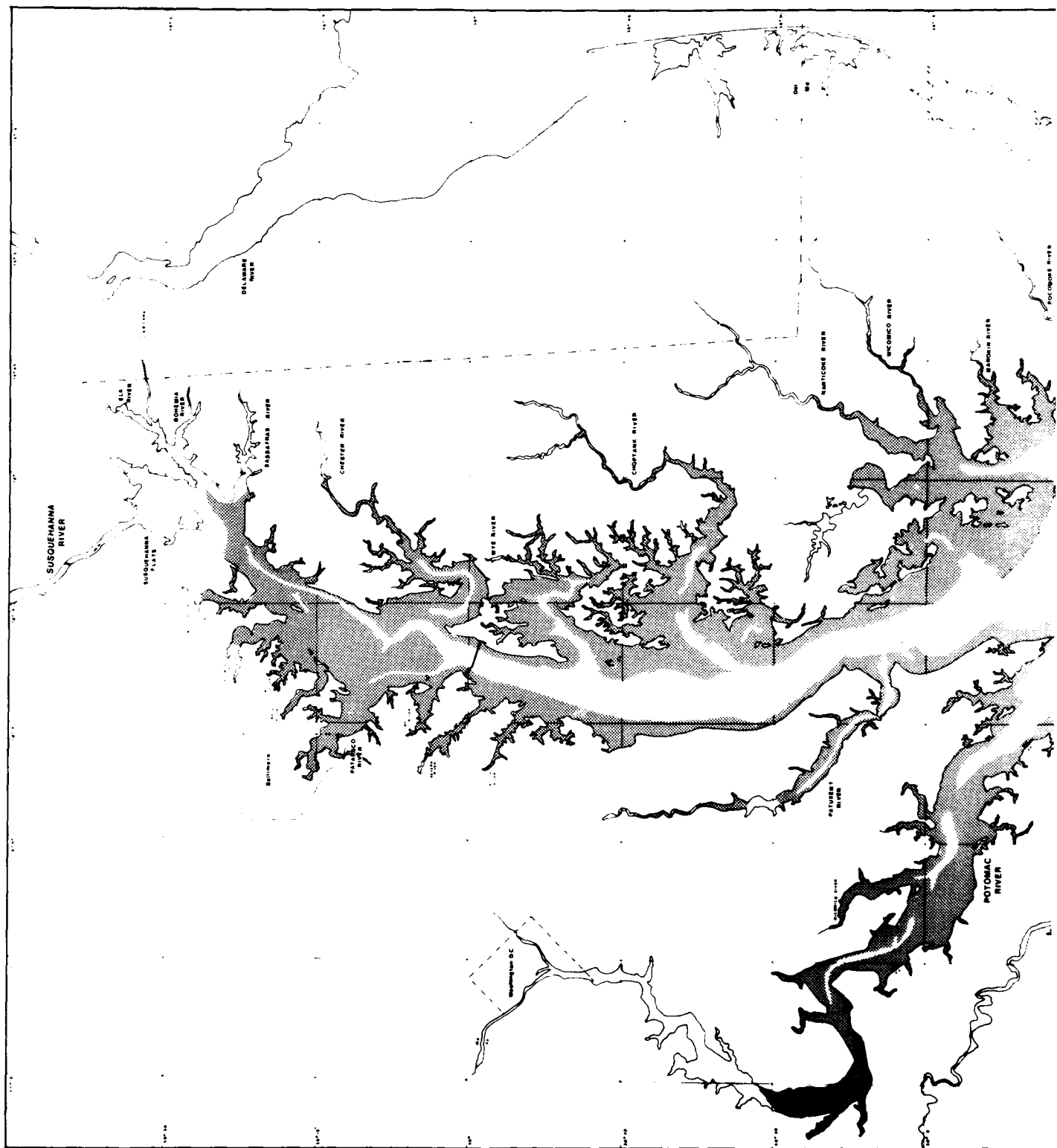




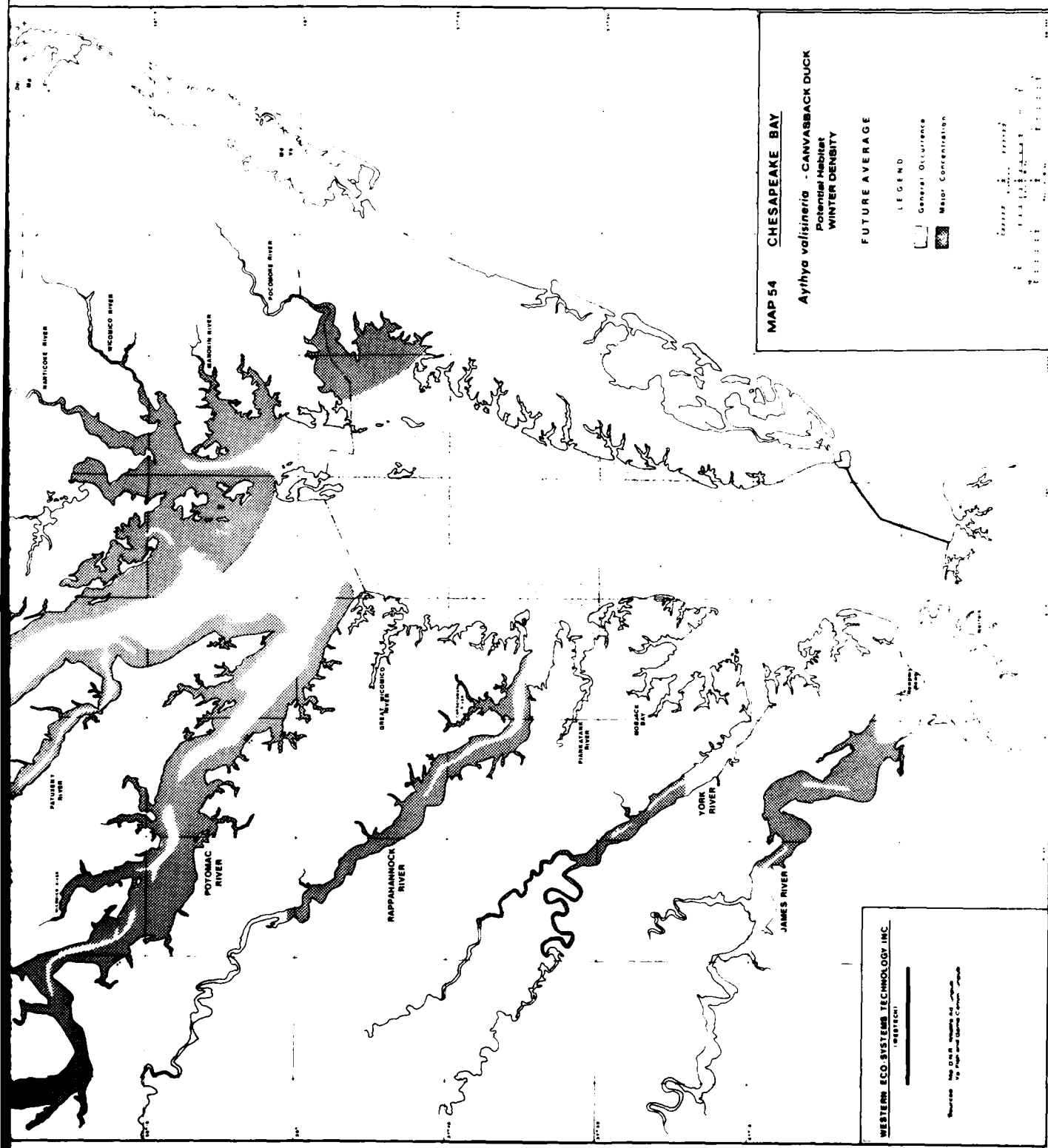


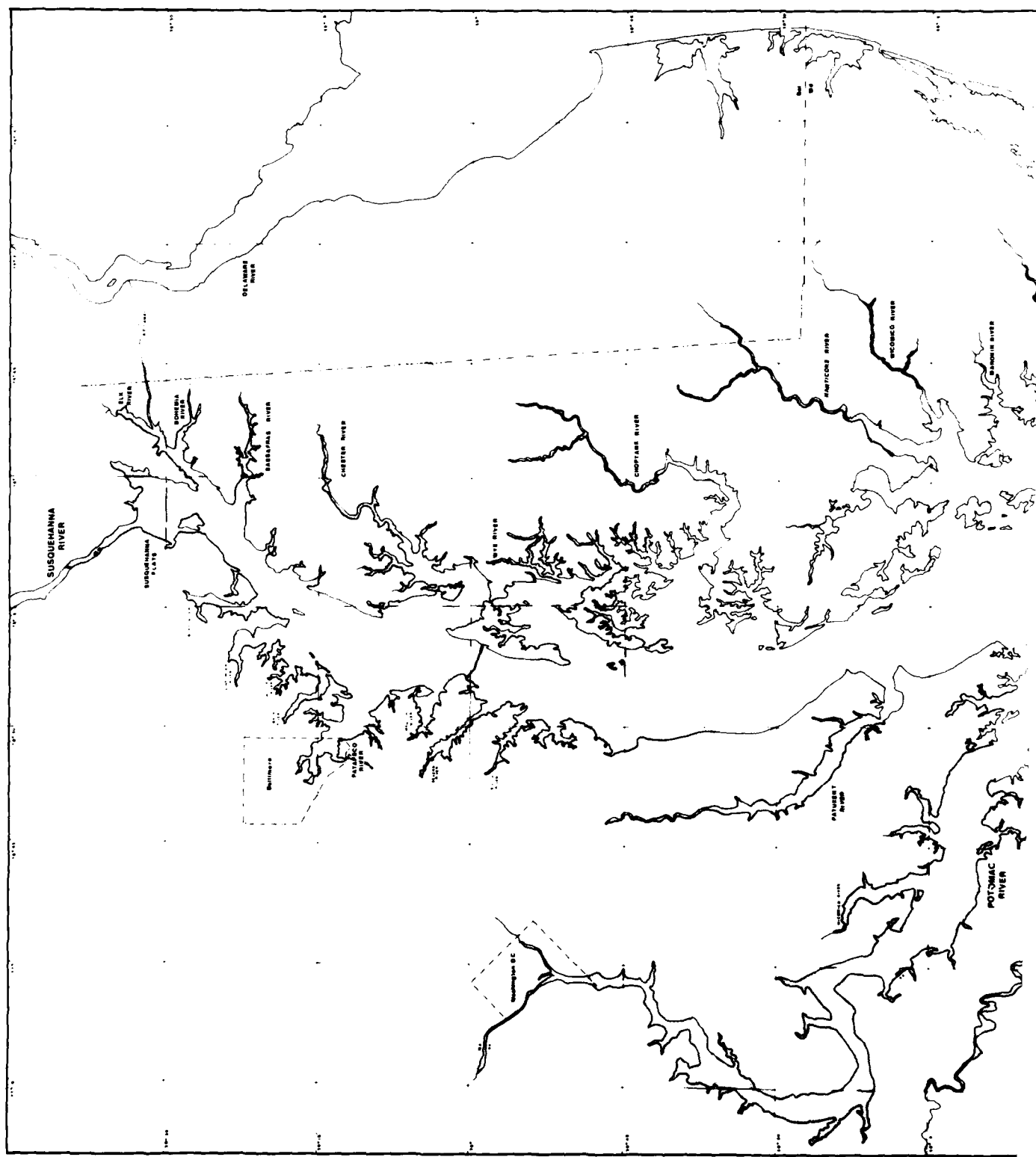






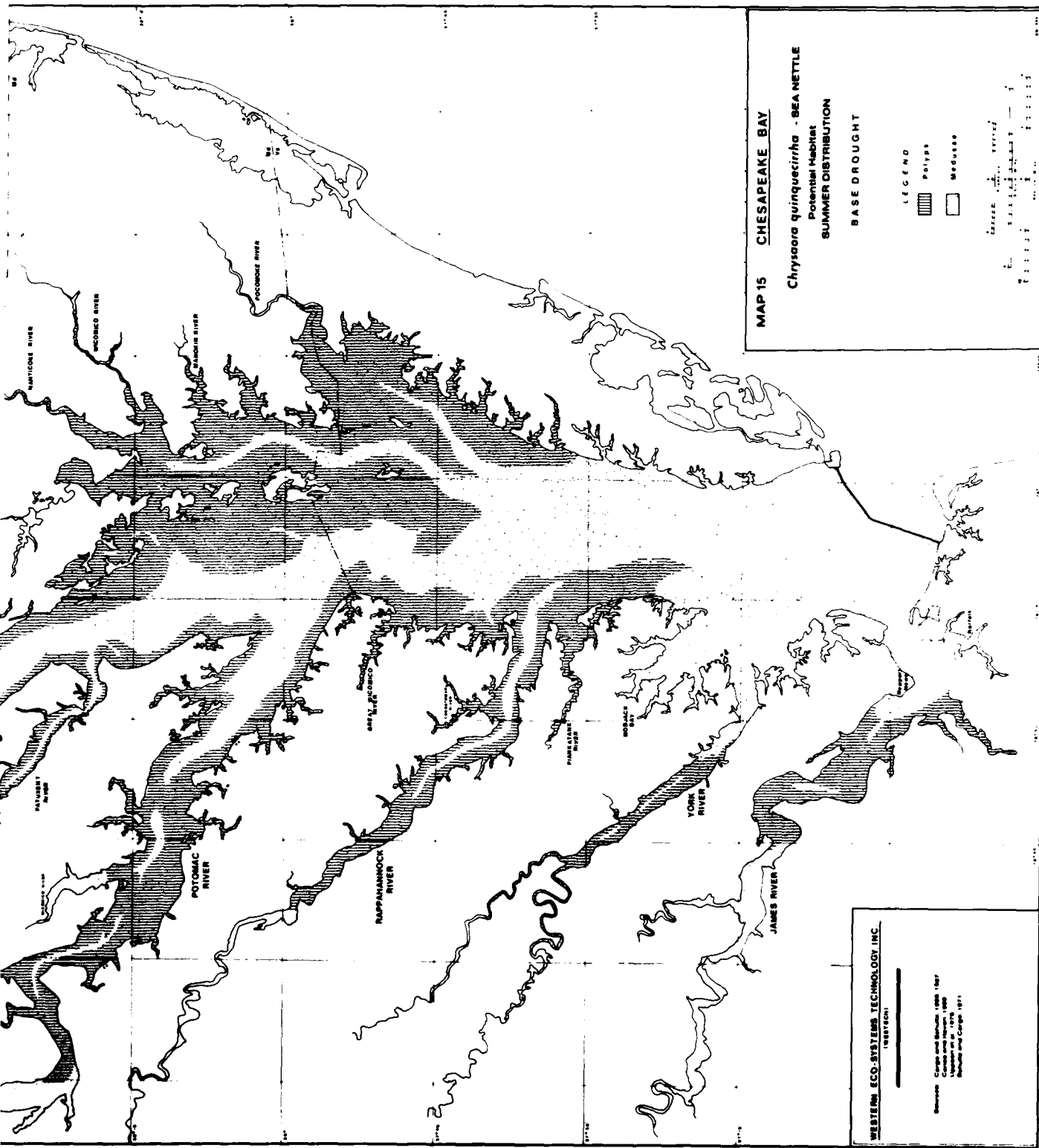


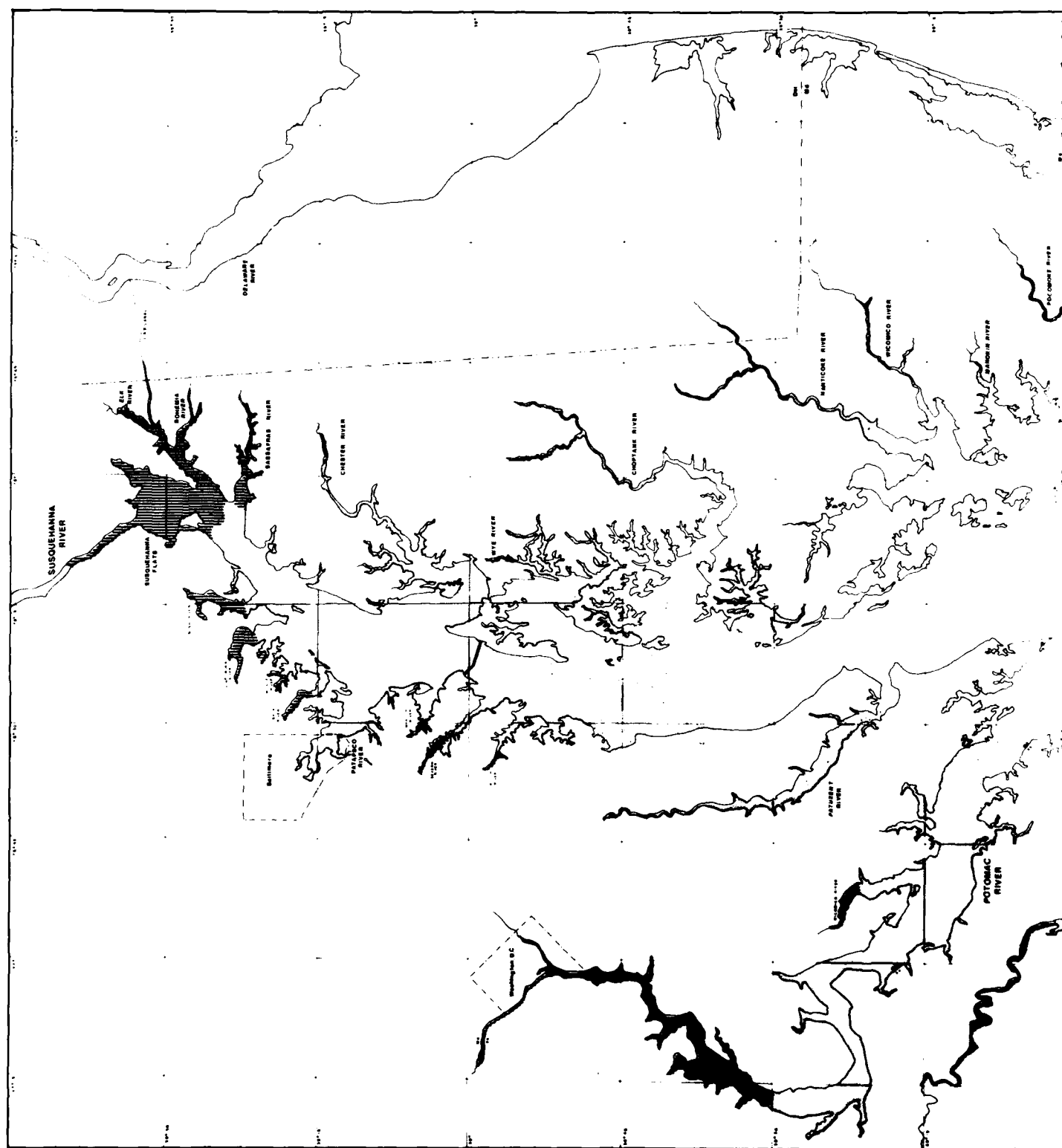




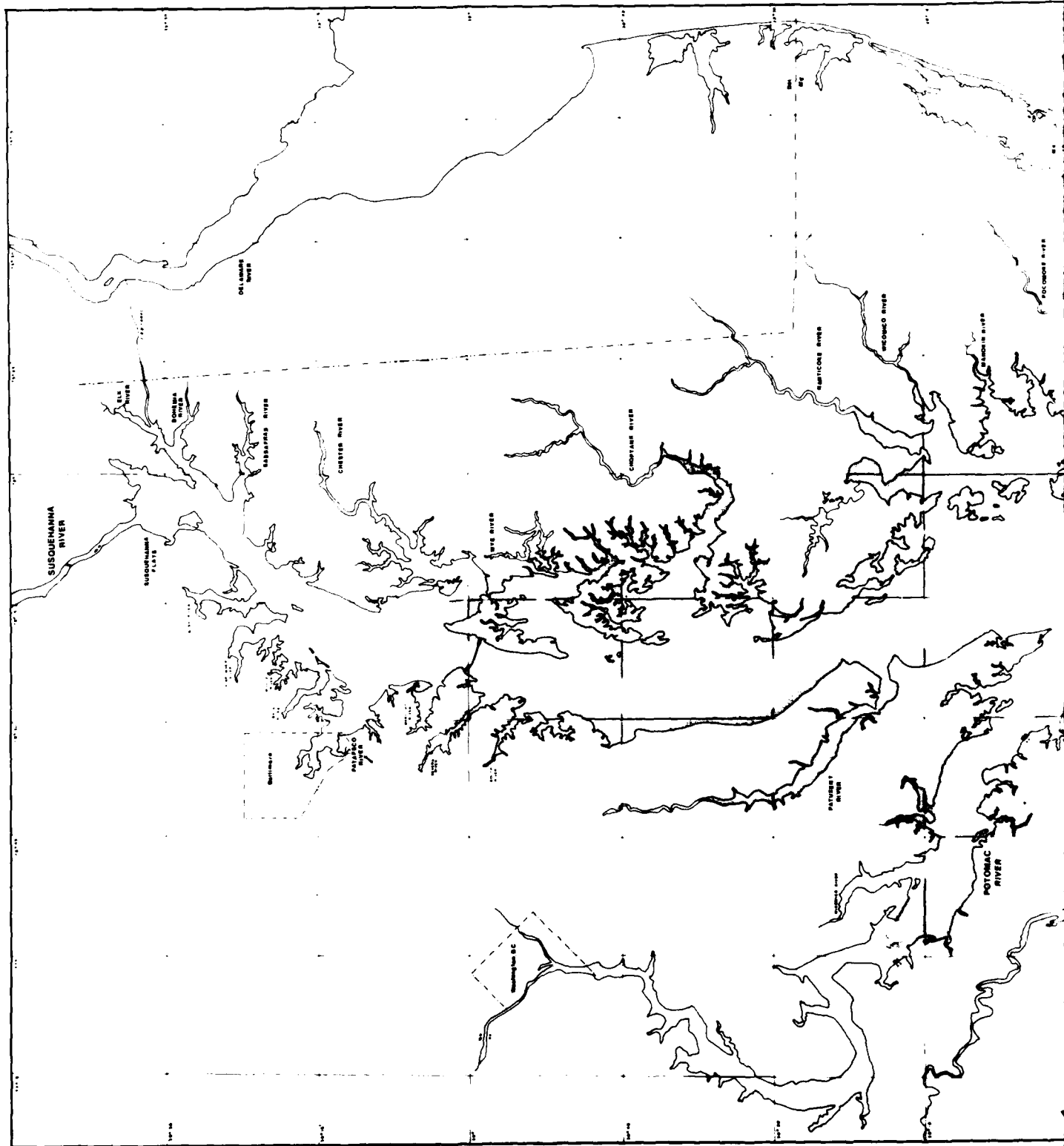




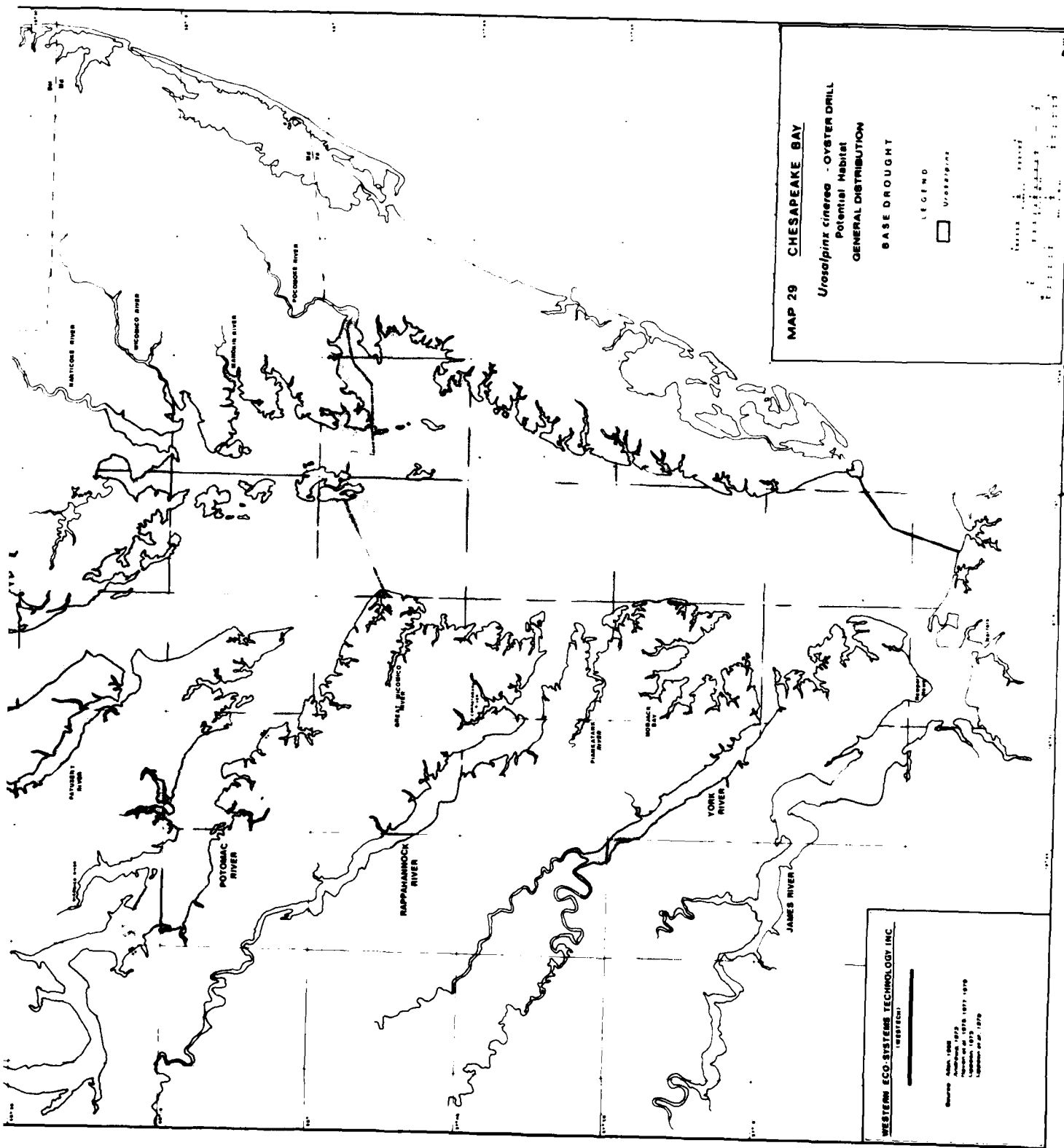


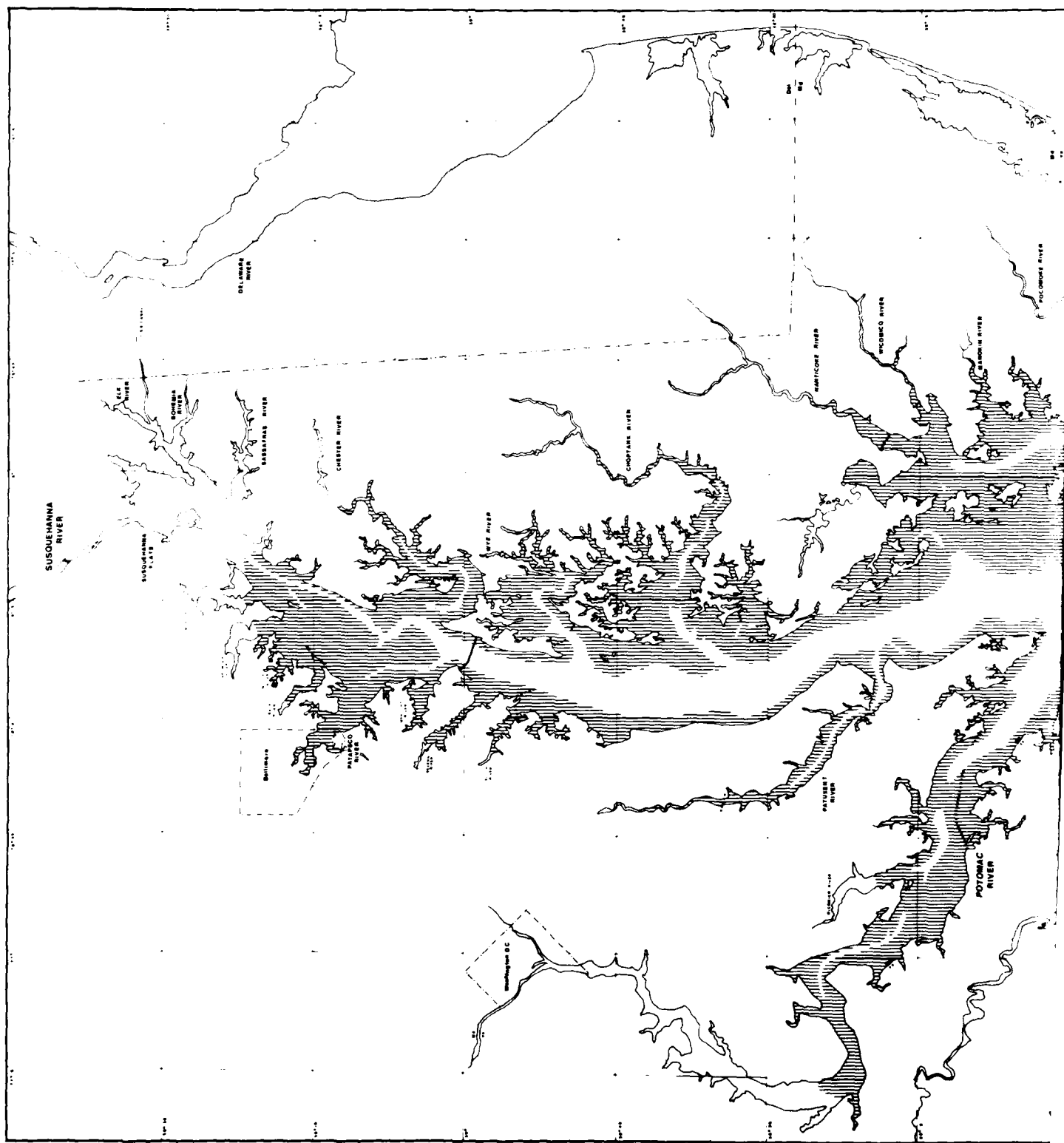


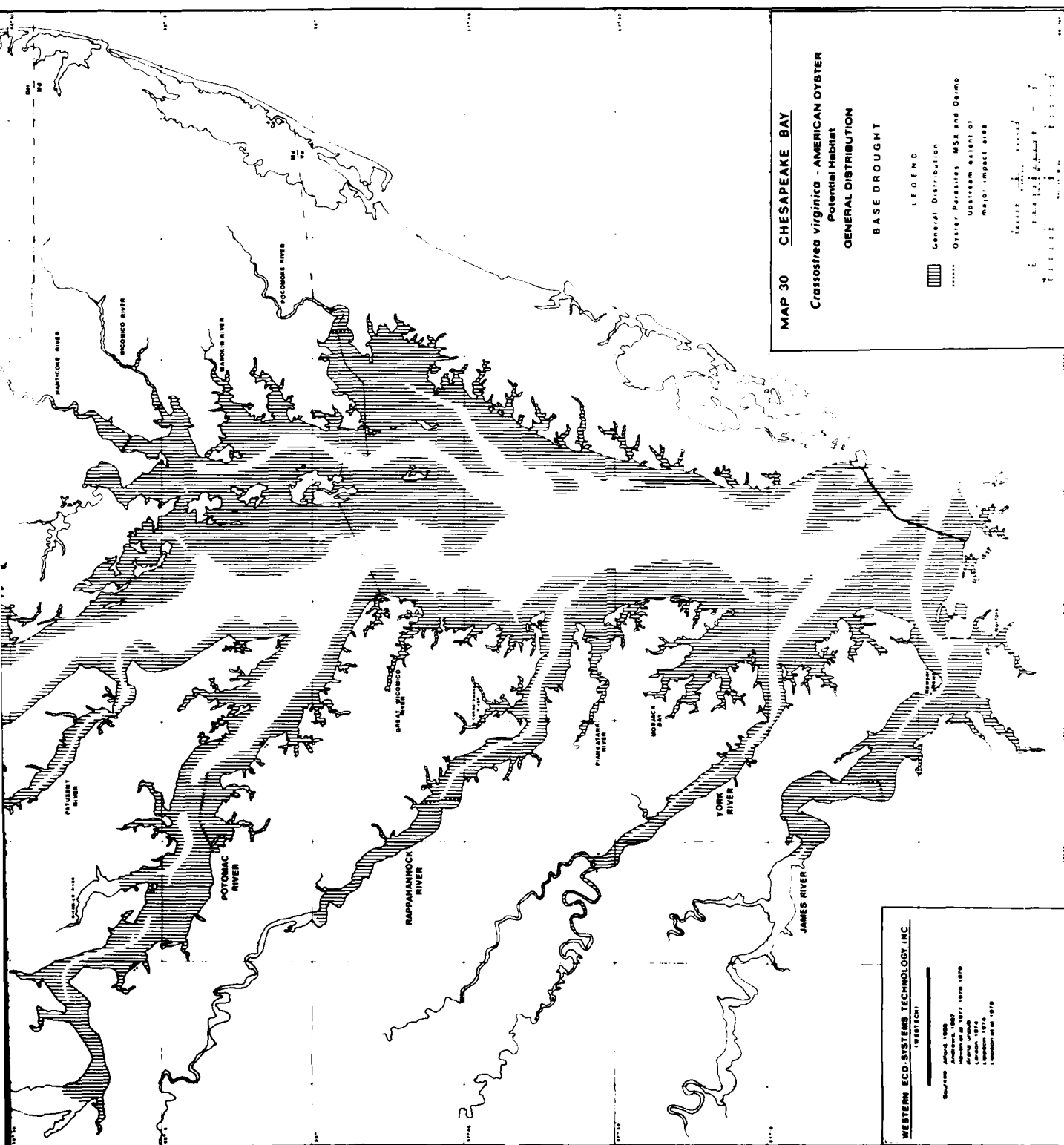












MAP 30 CHESAPEAKE BAY

*Crassostrea virginica* - AMERICAN OYSTER  
Potential Habitat

GENERAL DISTRIBUTION

BASE DROUGHT

LEGEND

General Distribution

Oyster Parasites, MSX and Dermo

Upstream extent of

Major impact sites

WESTERN ECO-SYSTEMS TECHNOLOGY, INC.  
(WESTECH)

Developed April, 1988

Amended, 1987

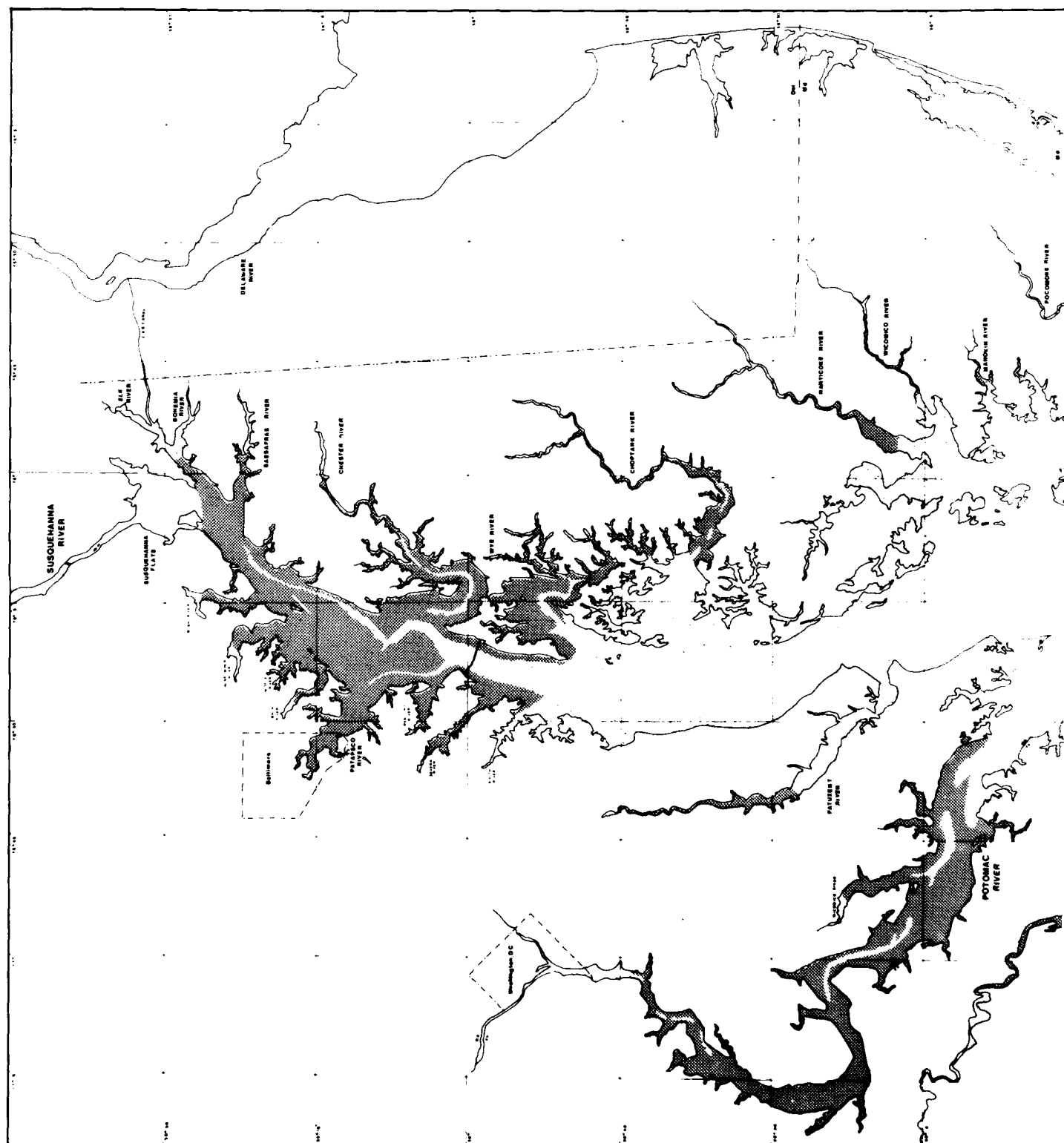
Amended, 1987

Amended, 1987

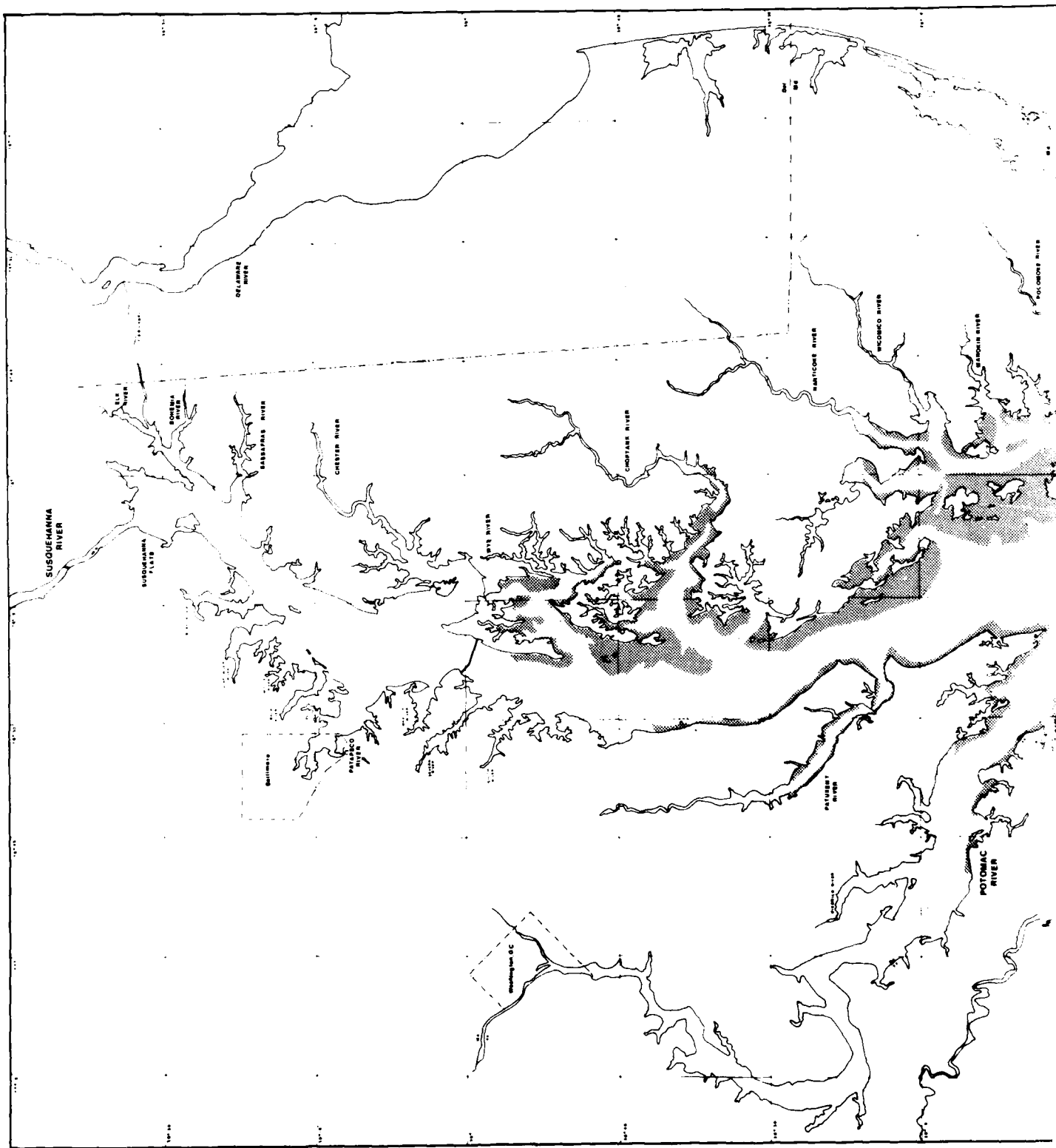
Amended, 1987

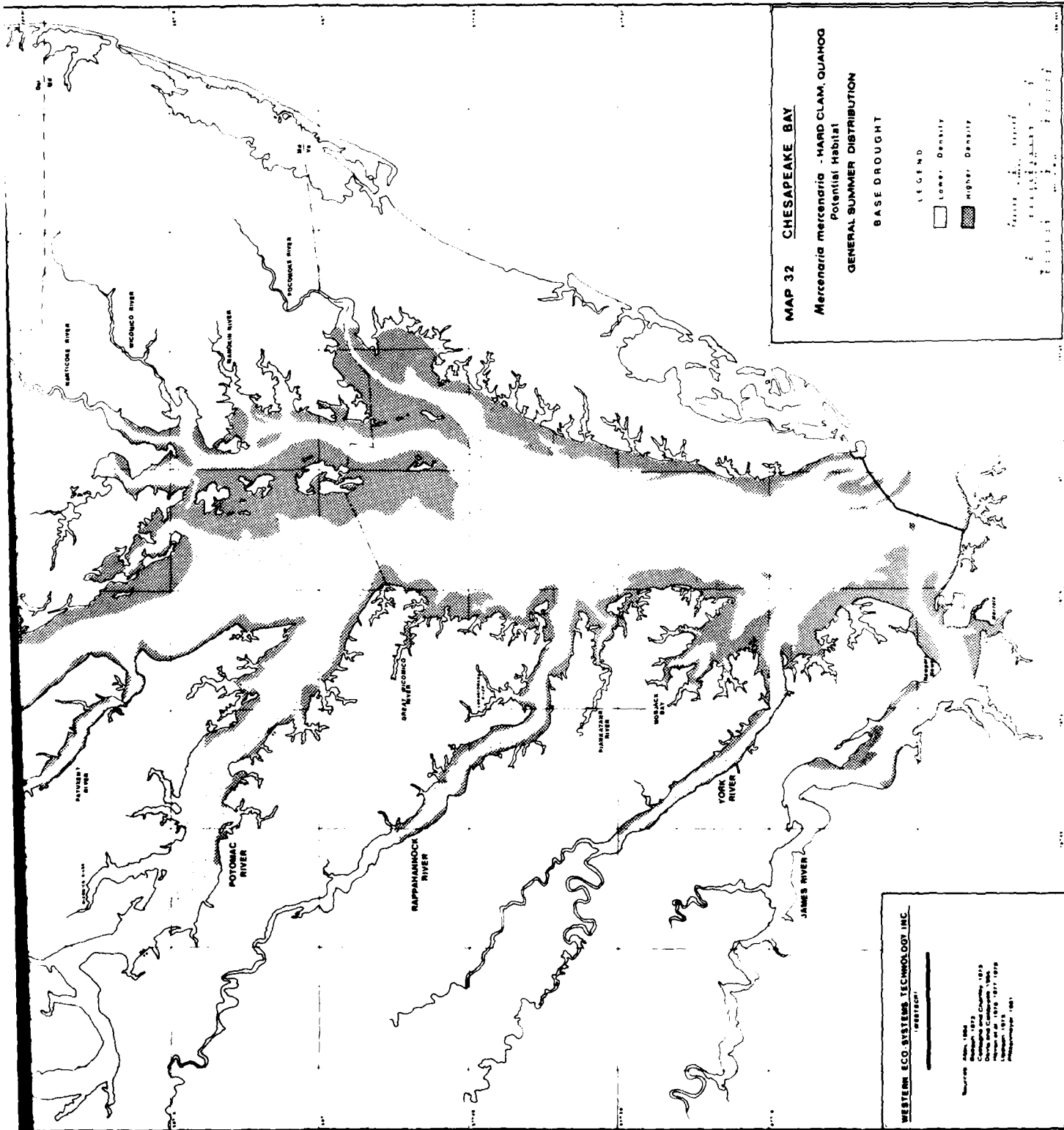
Amended, 1987

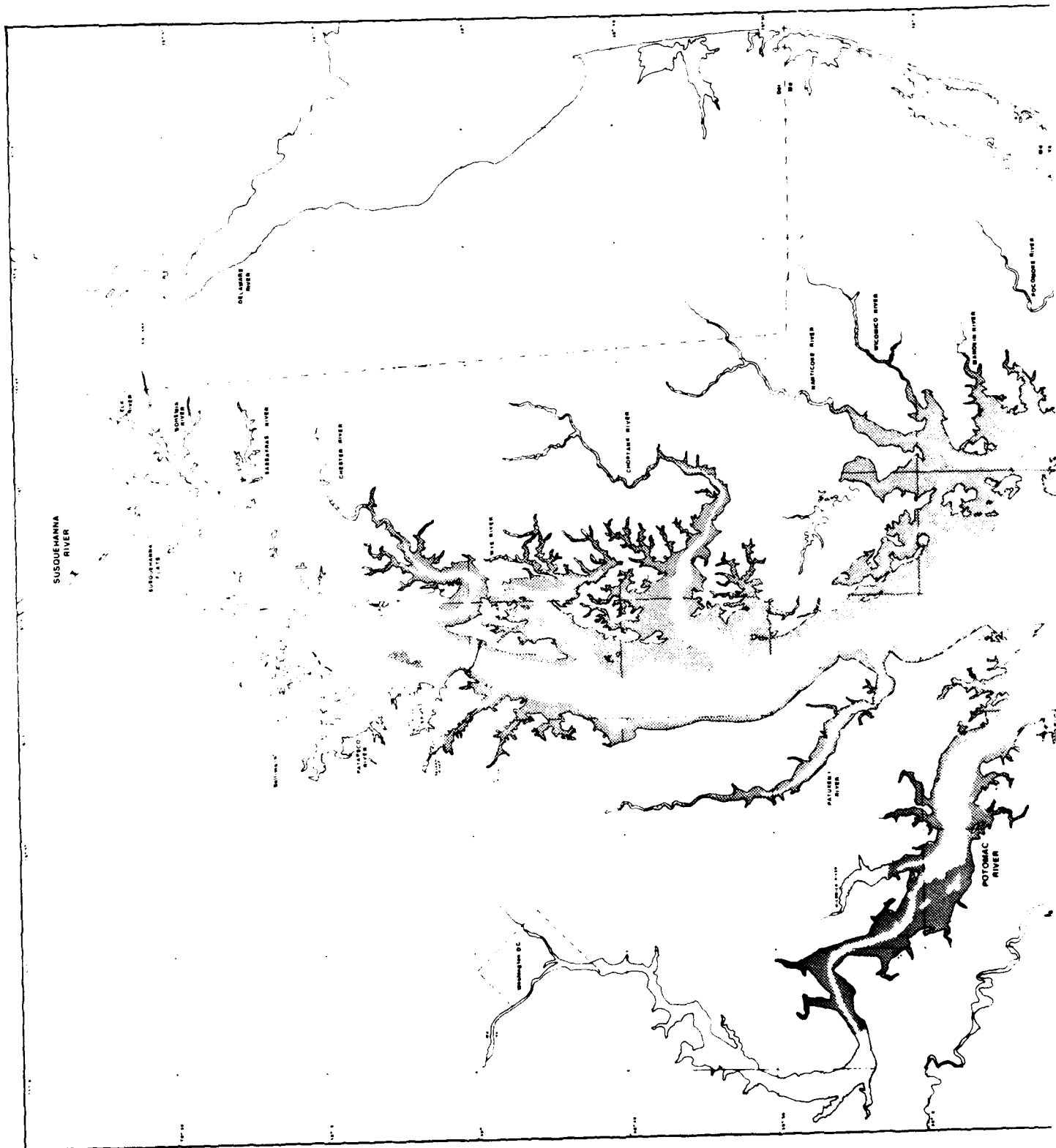
Amended, 1987





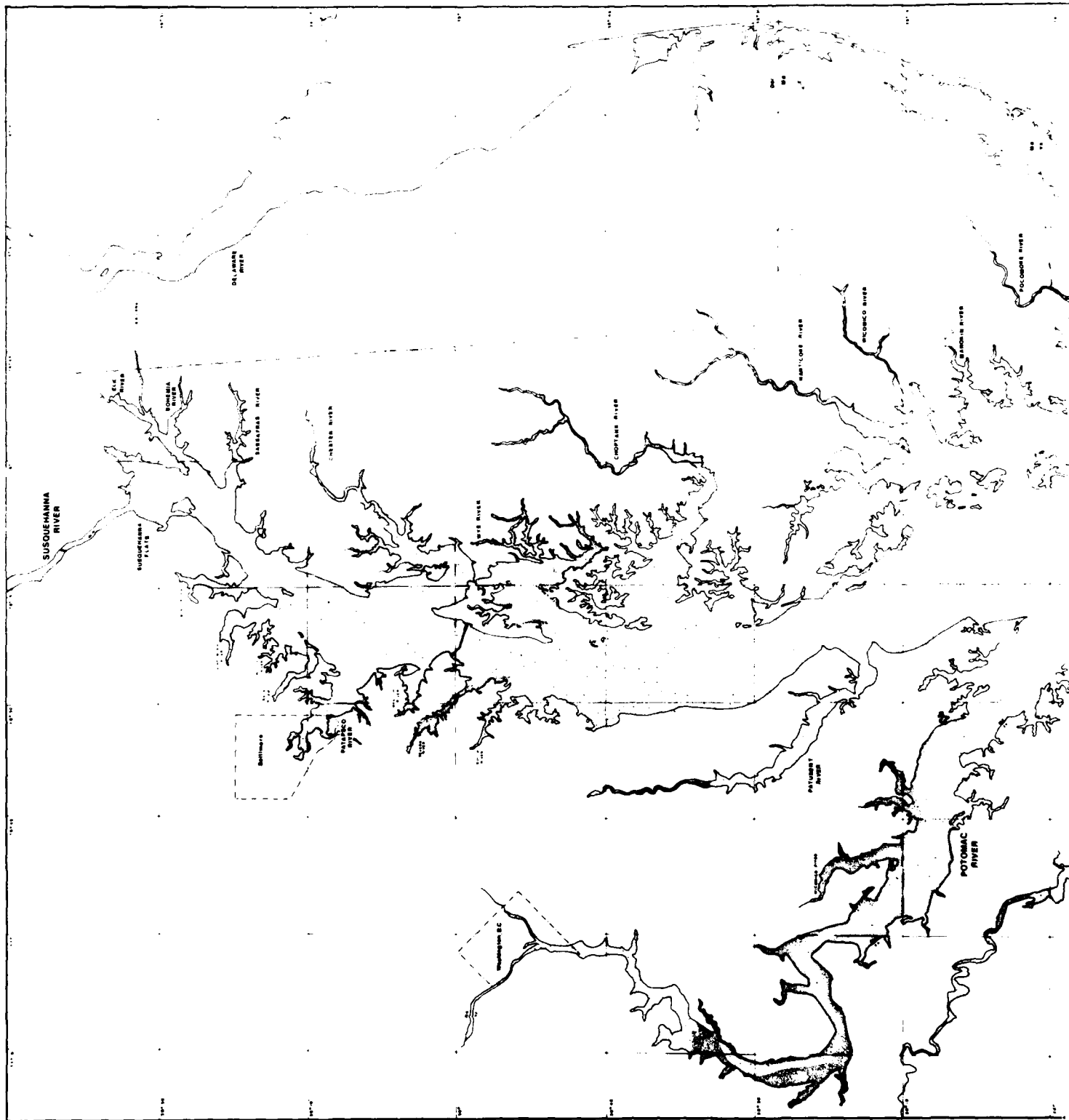


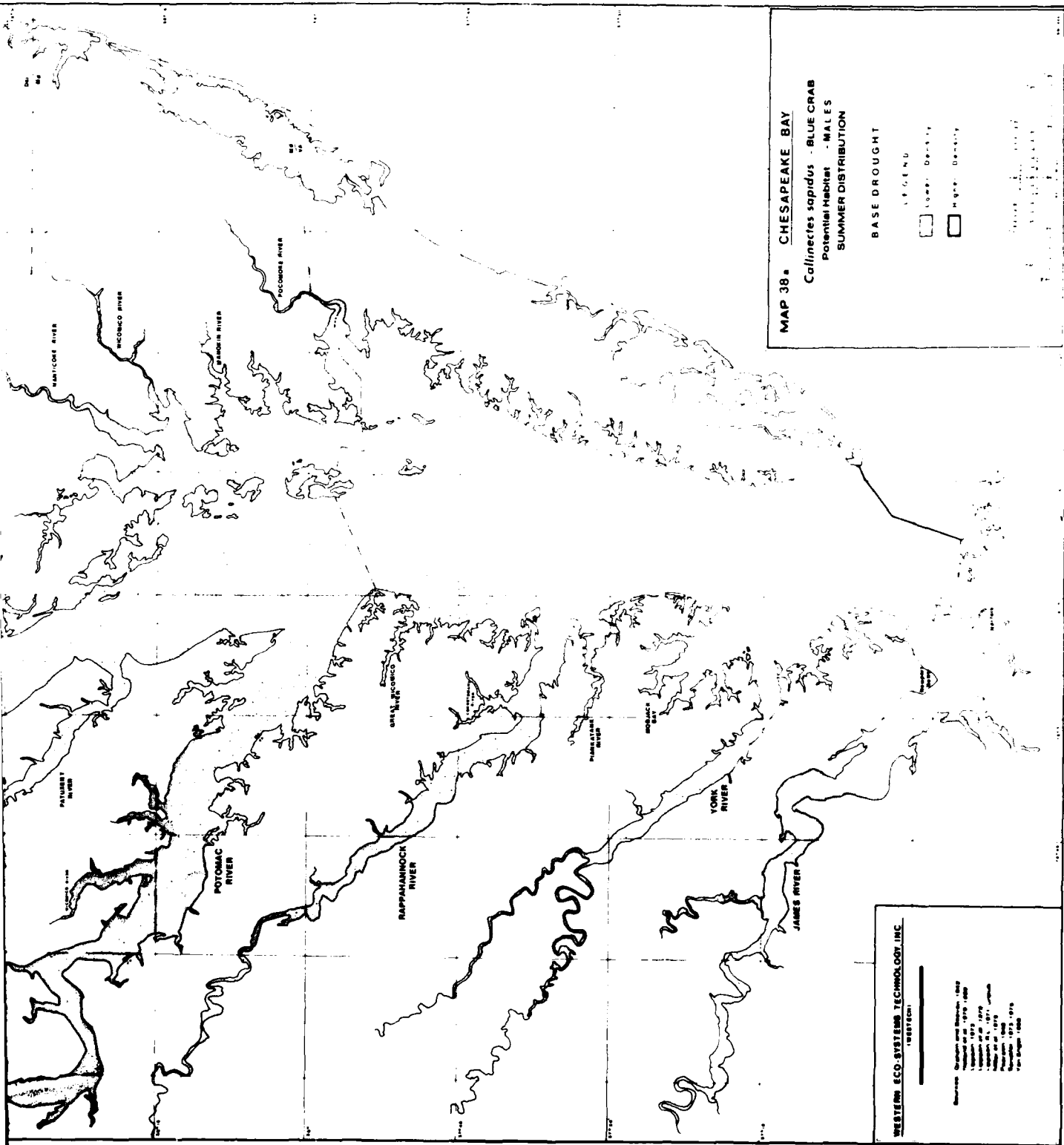


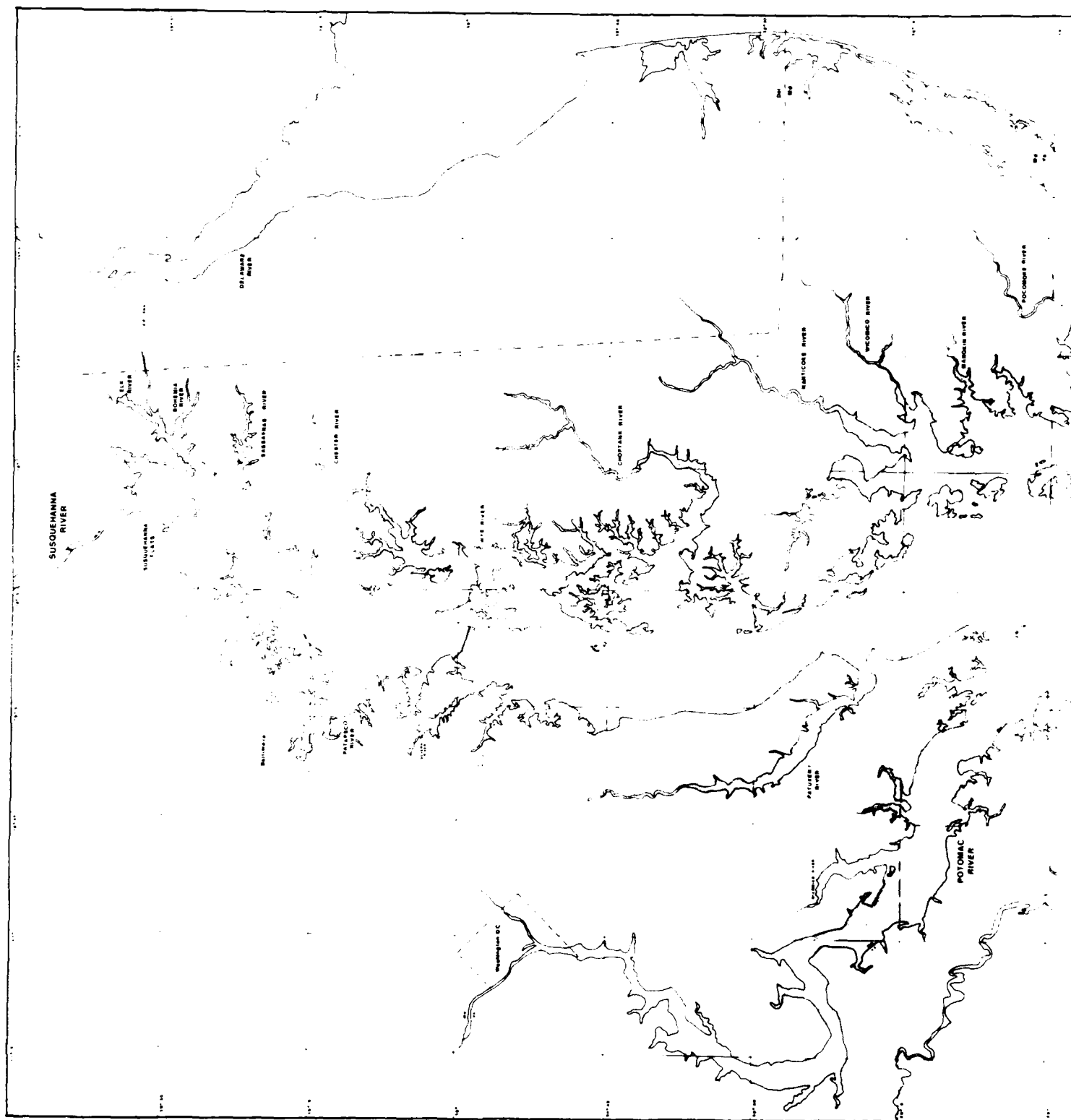




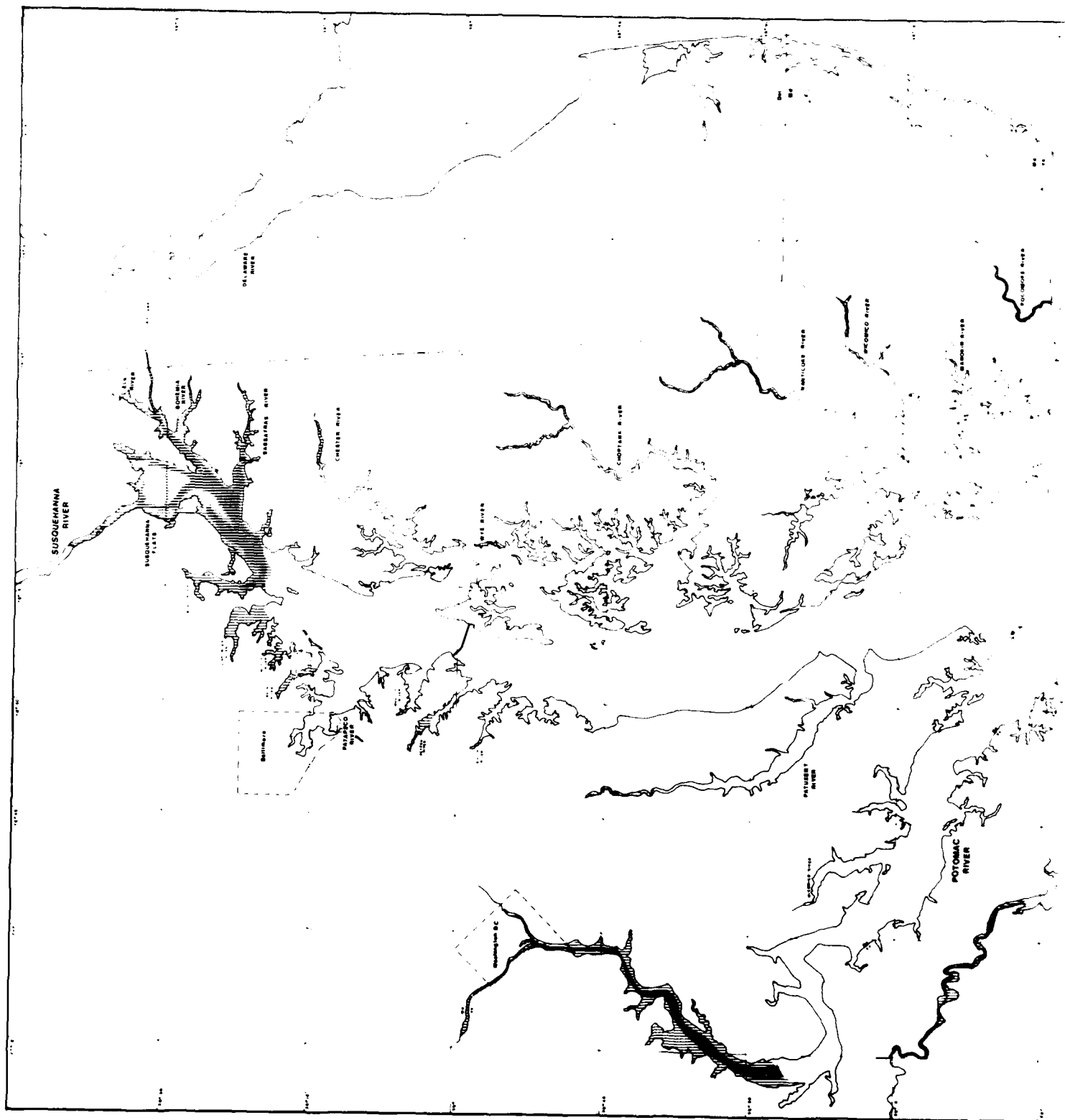




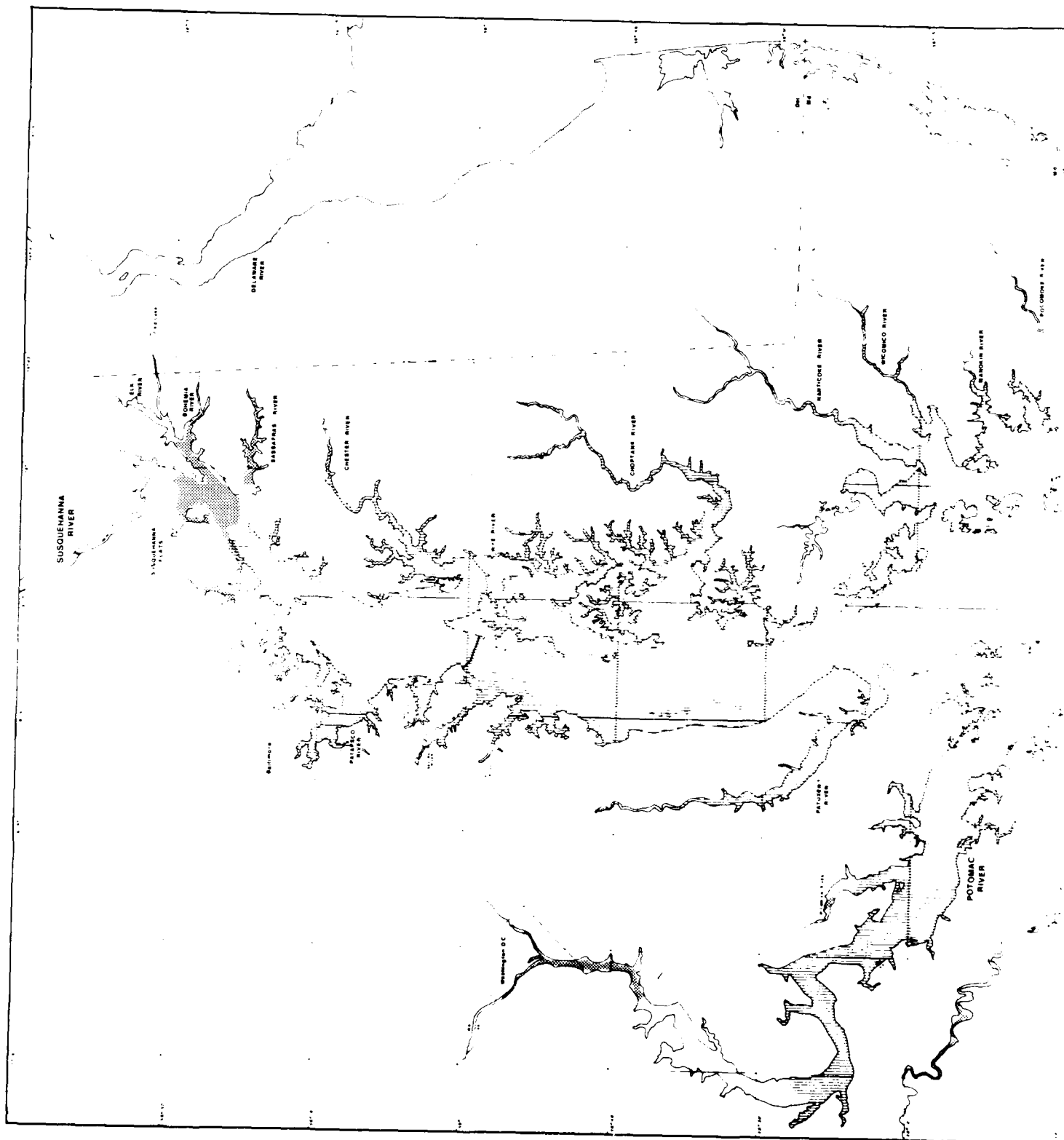




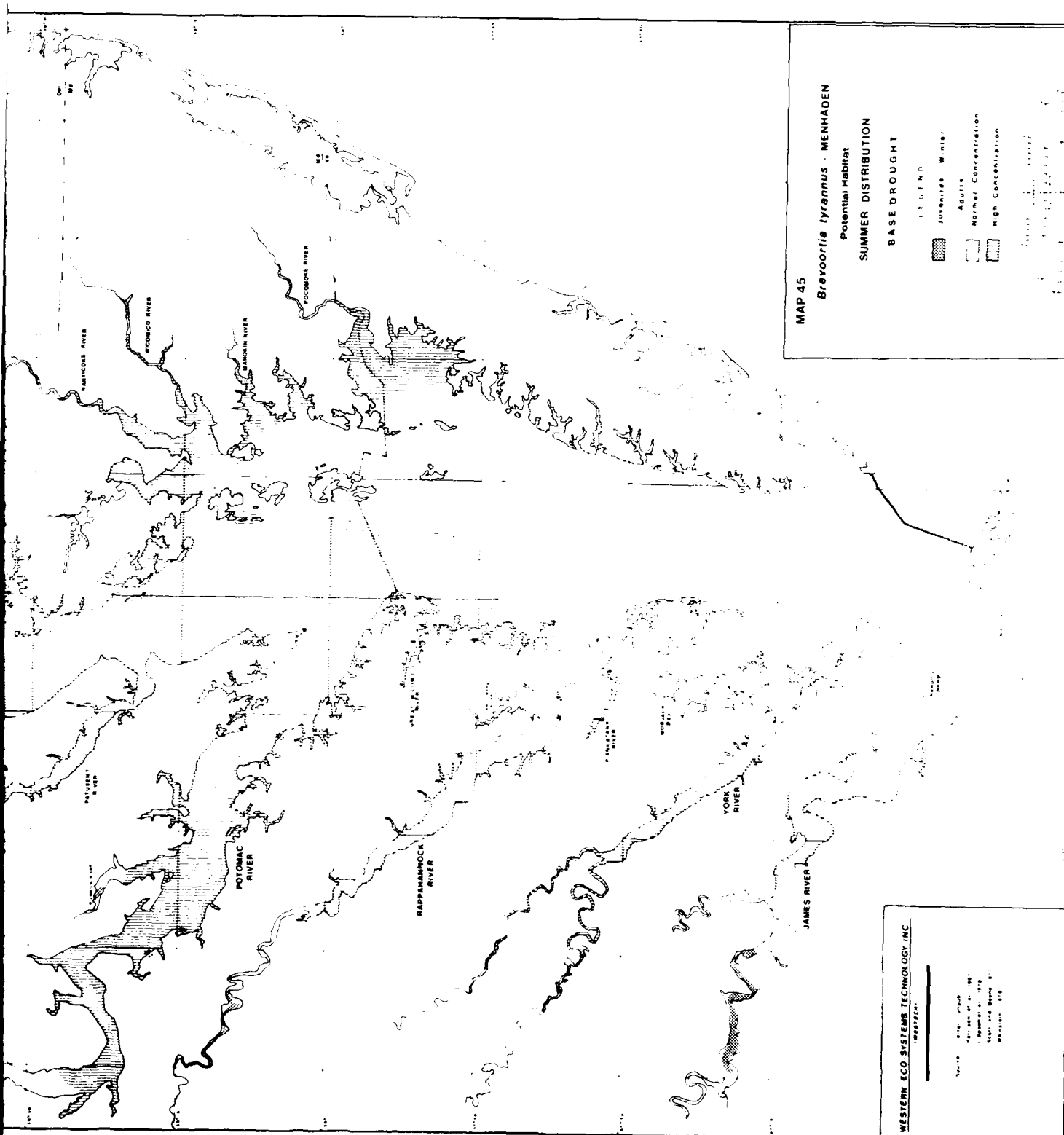


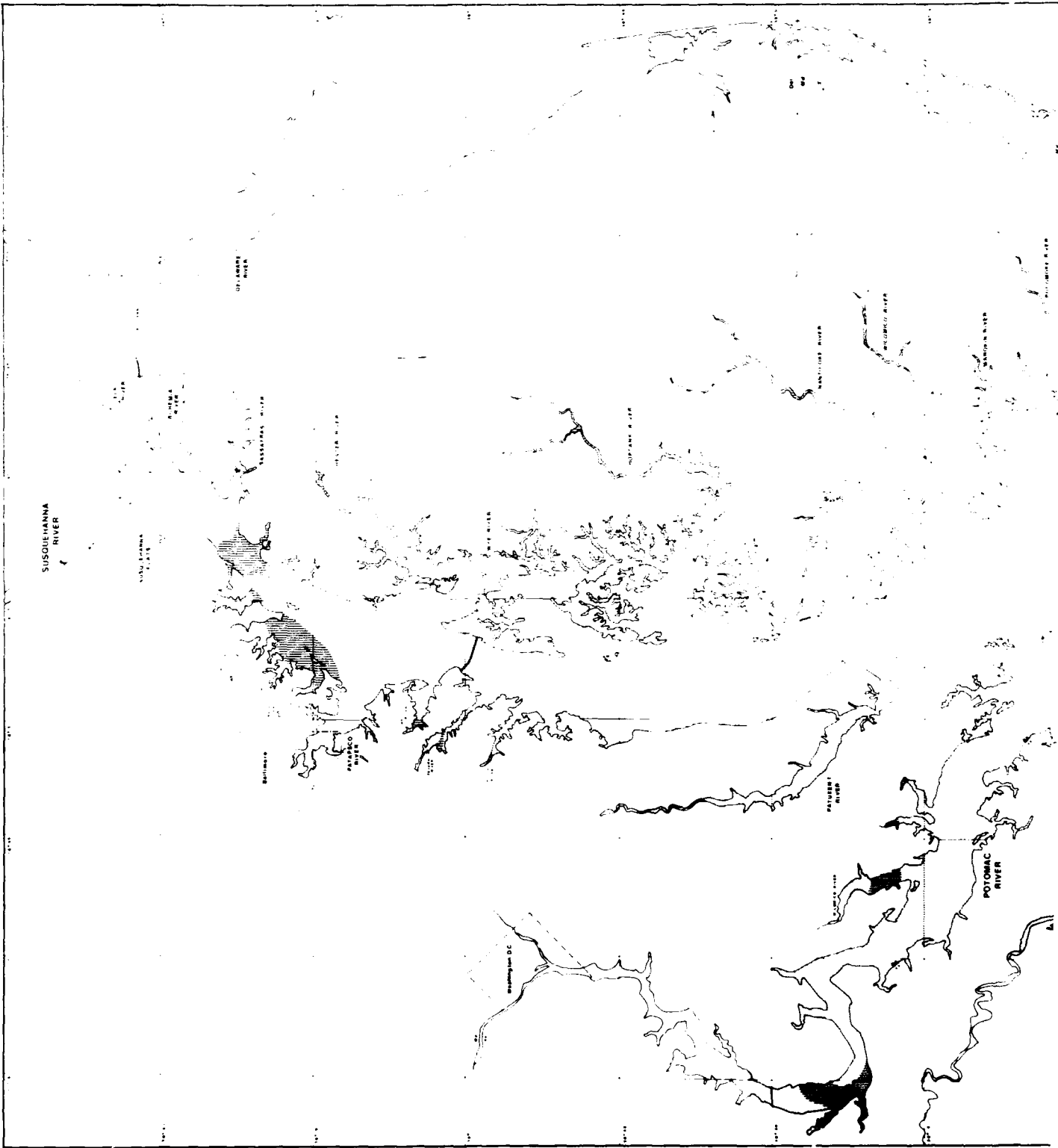


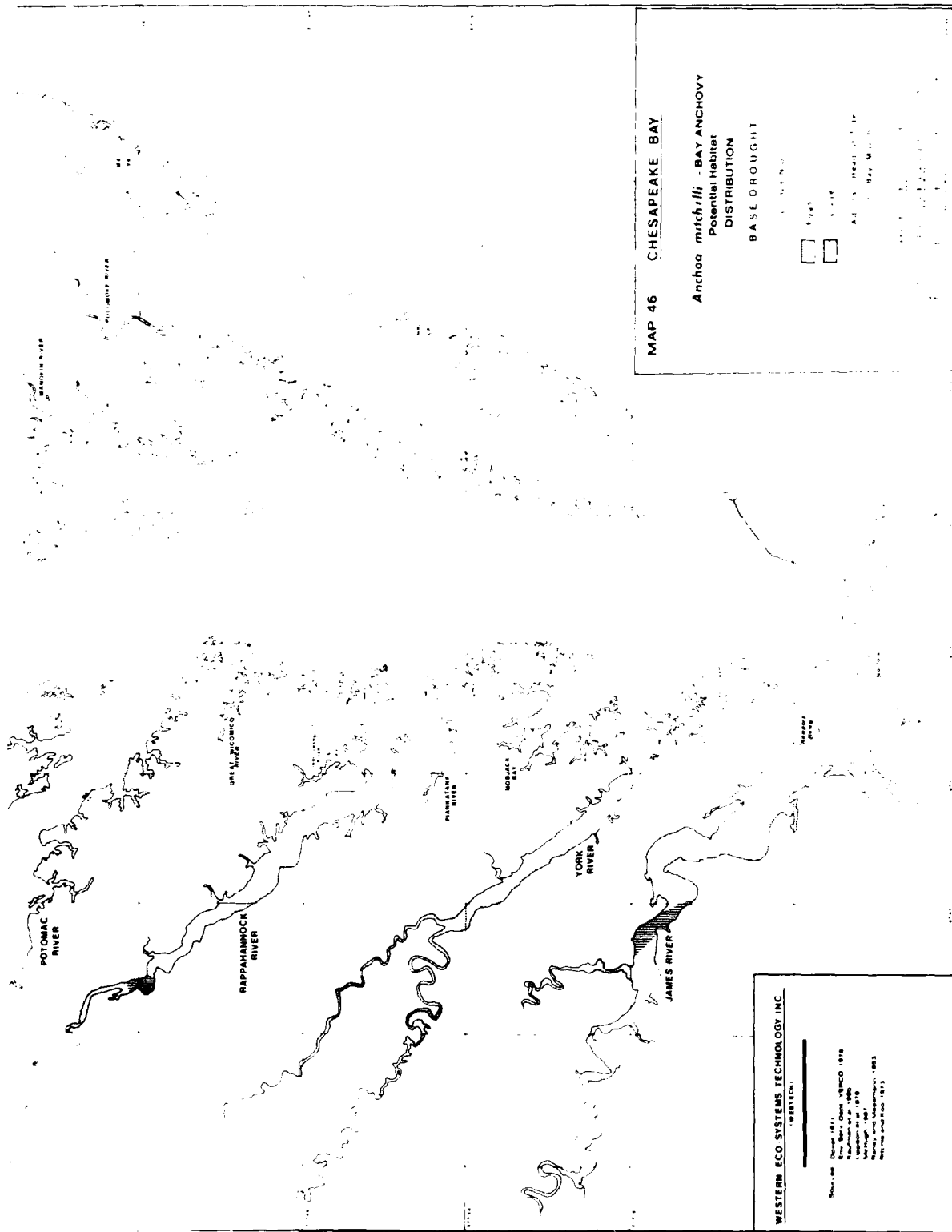


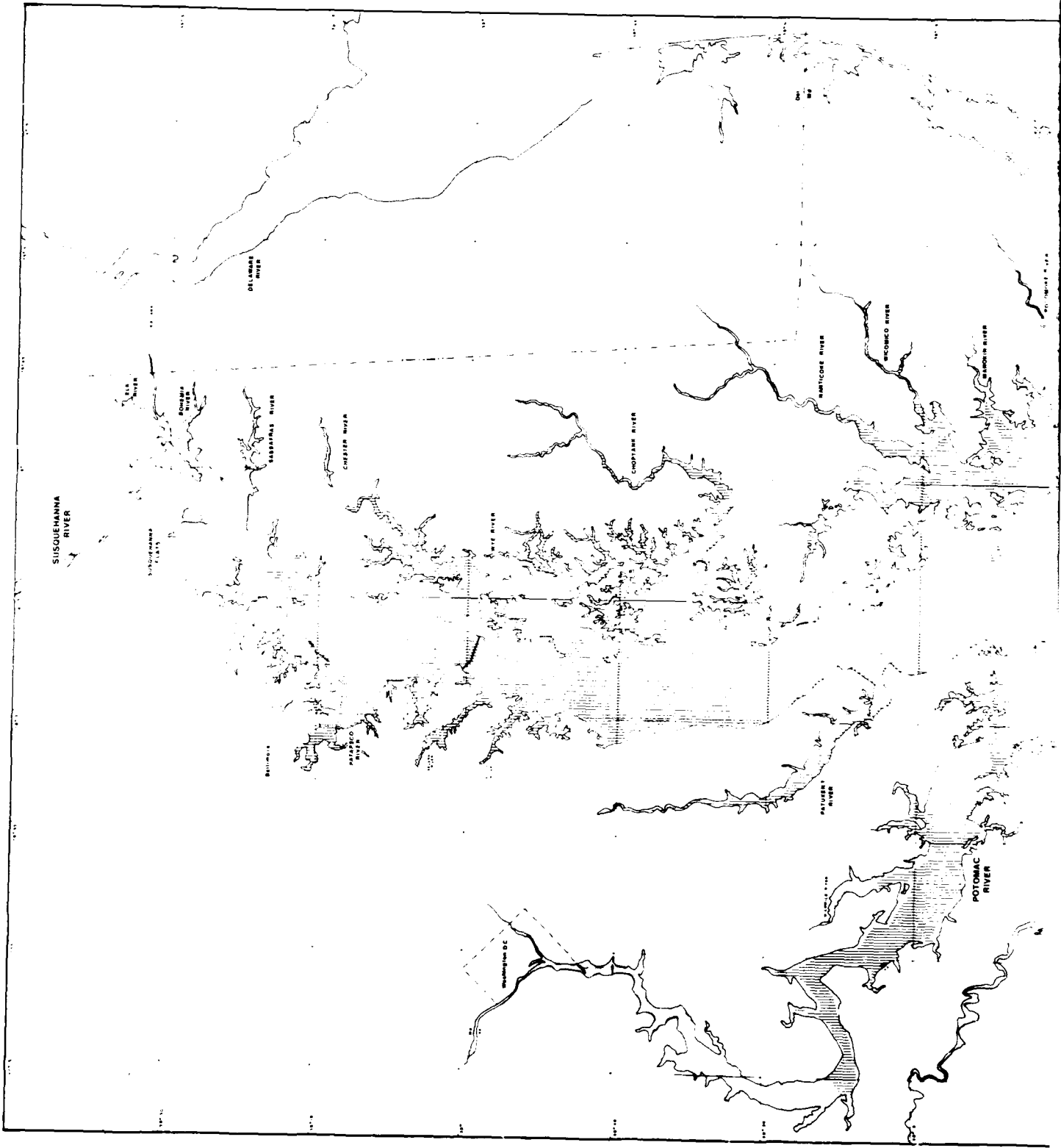


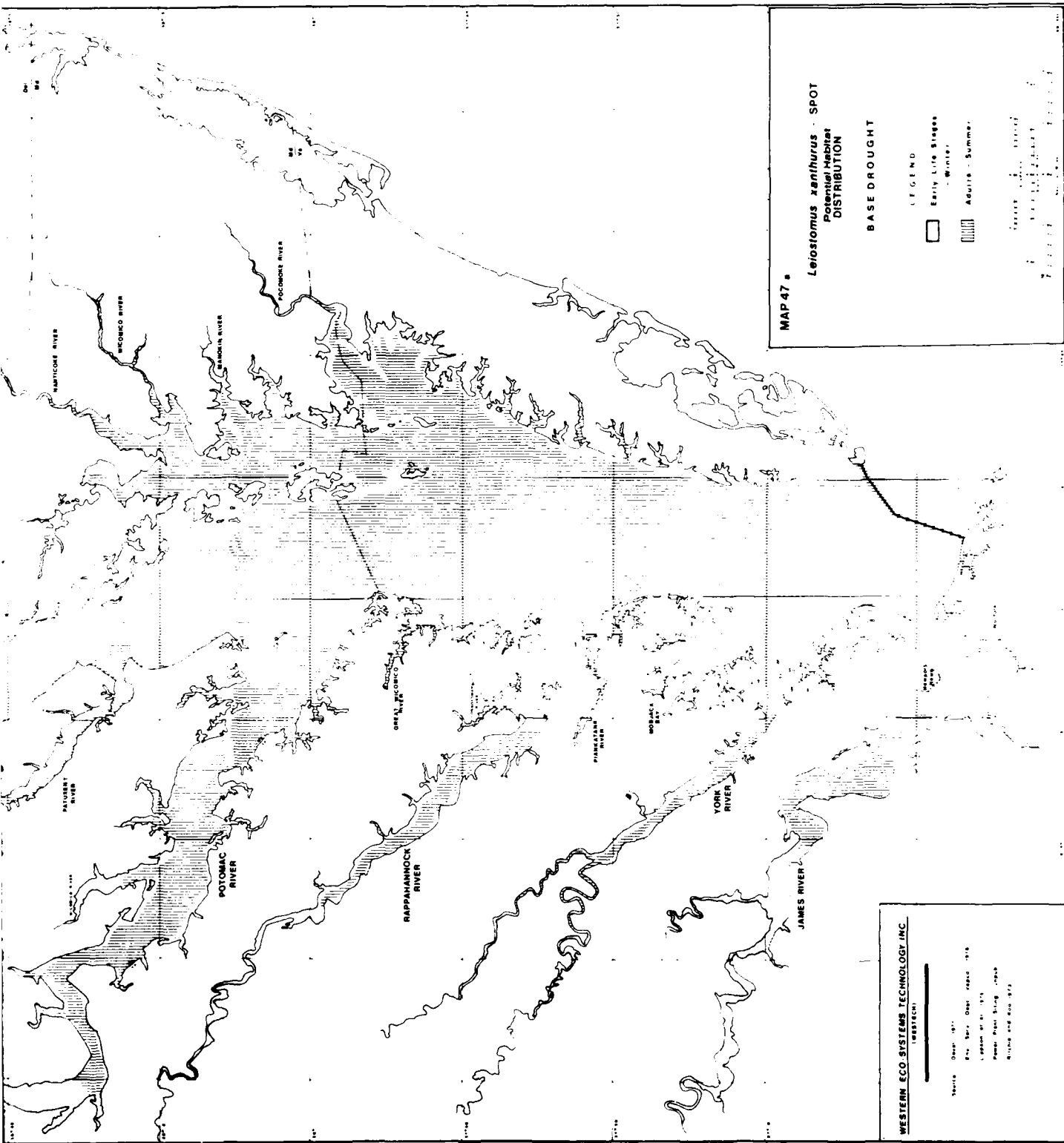


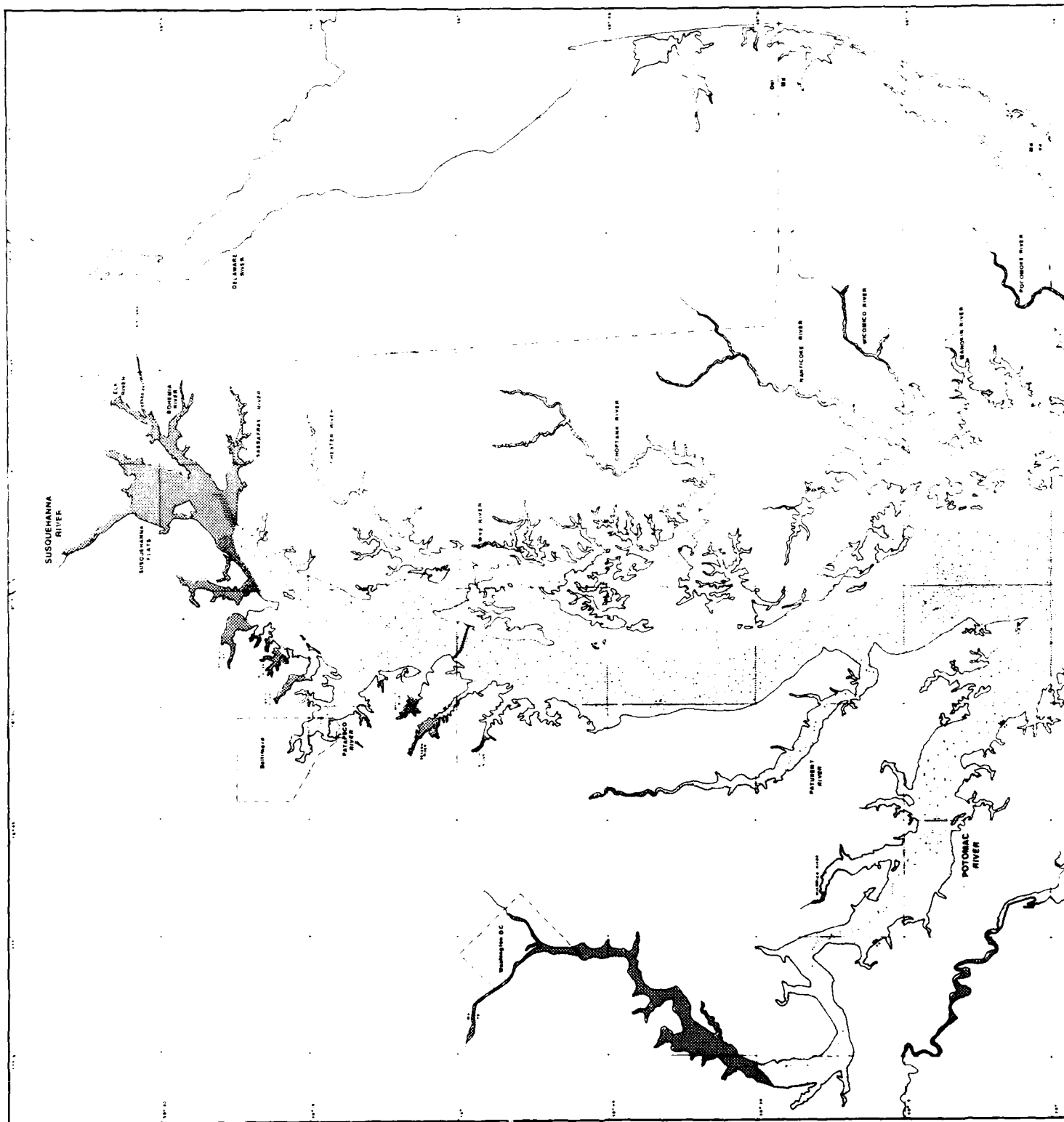


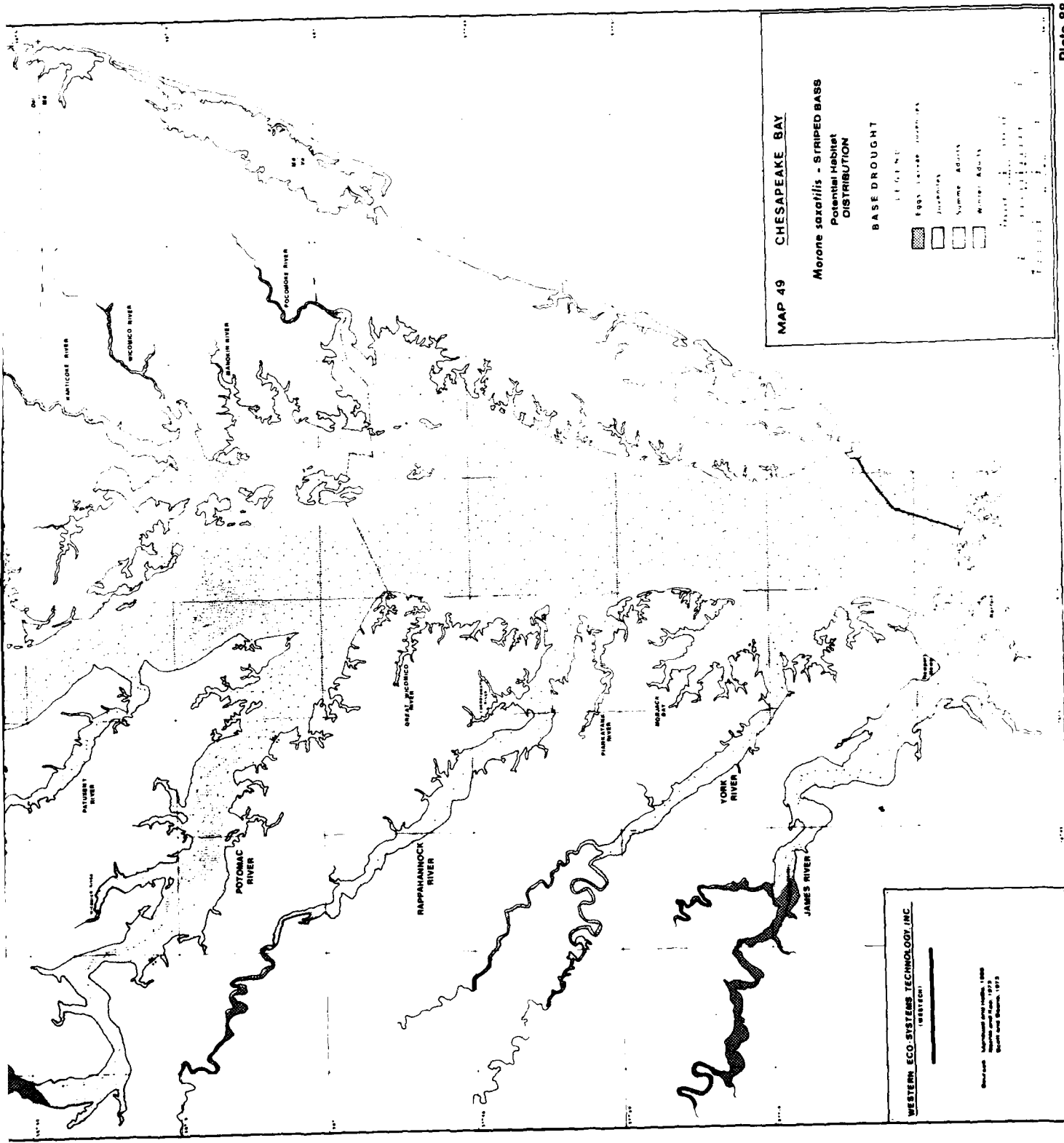












**MAP 49 CHESAPEAKE BAY**

***Morone saxatilis* - STRIPED BASS**  
Potential Habitat  
DISTRIBUTION

**BASE DROUGHT**

**LEGEND**

- Eggs (stippled pattern)
- Juveniles (white)
- Summer Adults (light gray)
- Winter Adults (dark gray)

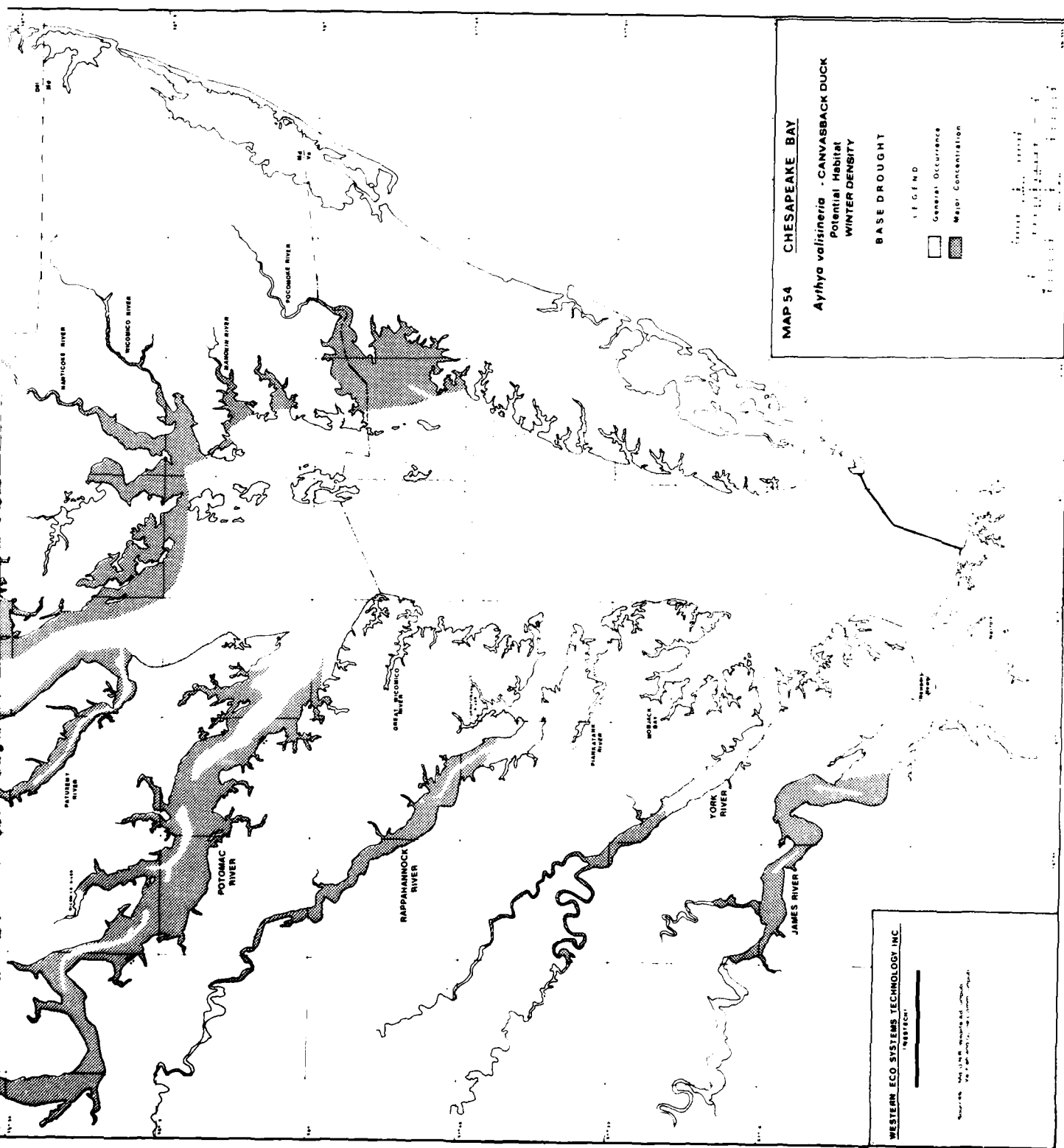
**Scale**  
0 10 20 Miles  
0 10 20 Kilometers

**WESTERN ECO-SYSTEMS TECHNOLOGY INC.**  
(WESTECH)

**Contract** *Support and Study, 1986*  
*Survey and Study, 1987*  
*Survey and Study, 1988*

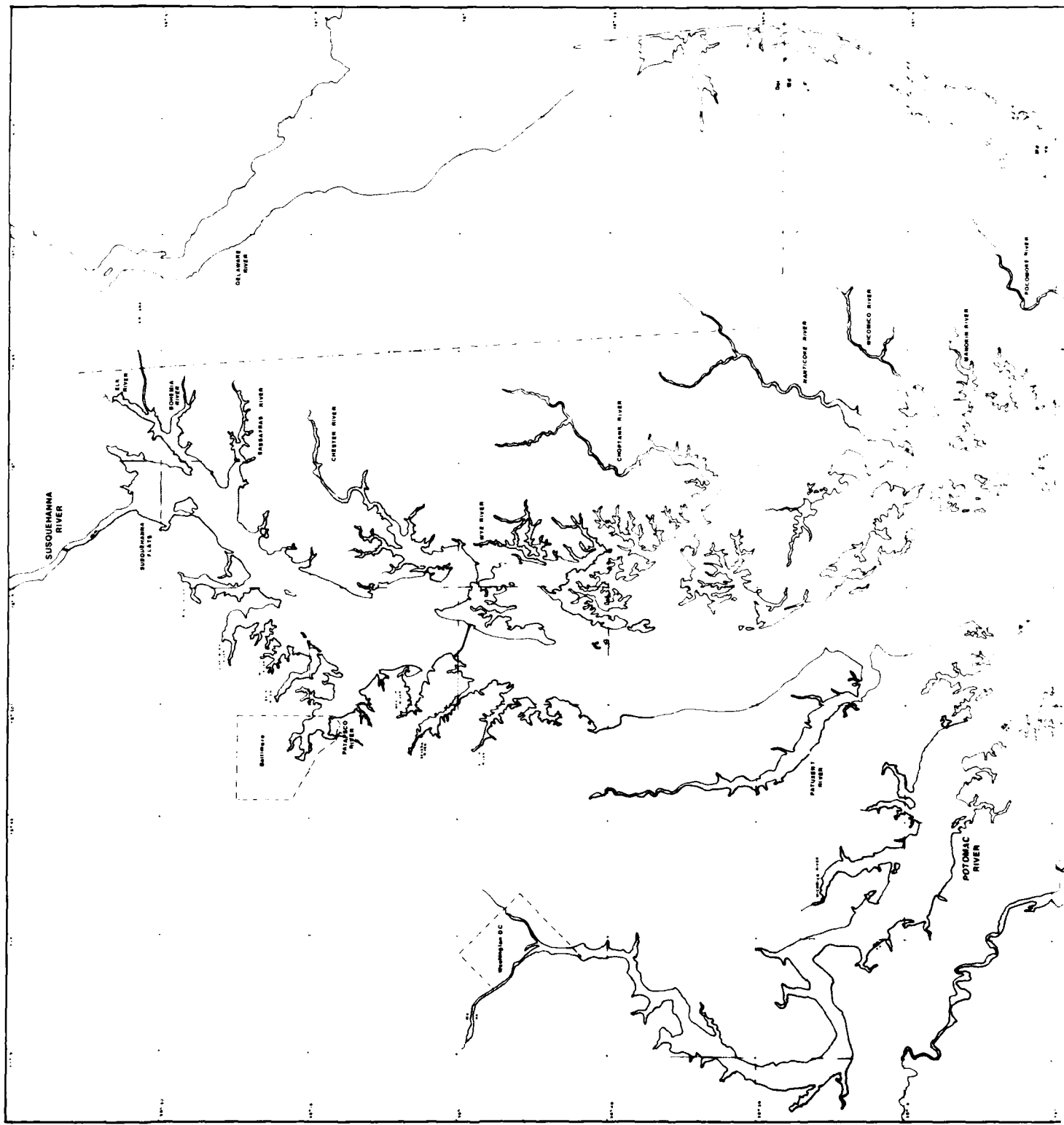


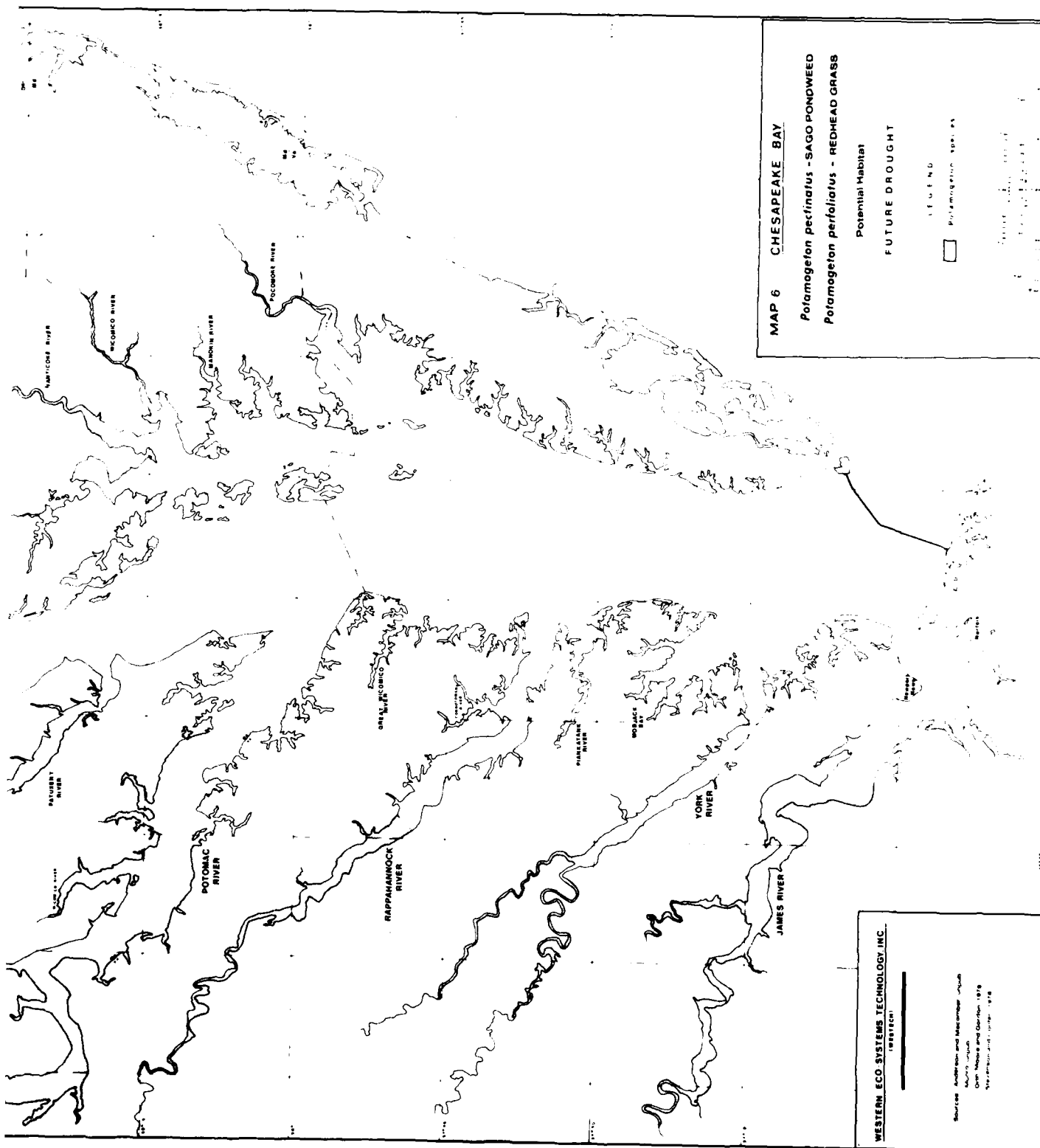




**WESTERN ECO SYSTEMS TECHNOLOGY INC.**  
 "SERVING THE ENVIRONMENT"

10000 N. 10th Avenue, Suite 100  
 Denver, CO 80231  
 (303) 751-1000





**MAP 6 CHESAPEAKE BAY**

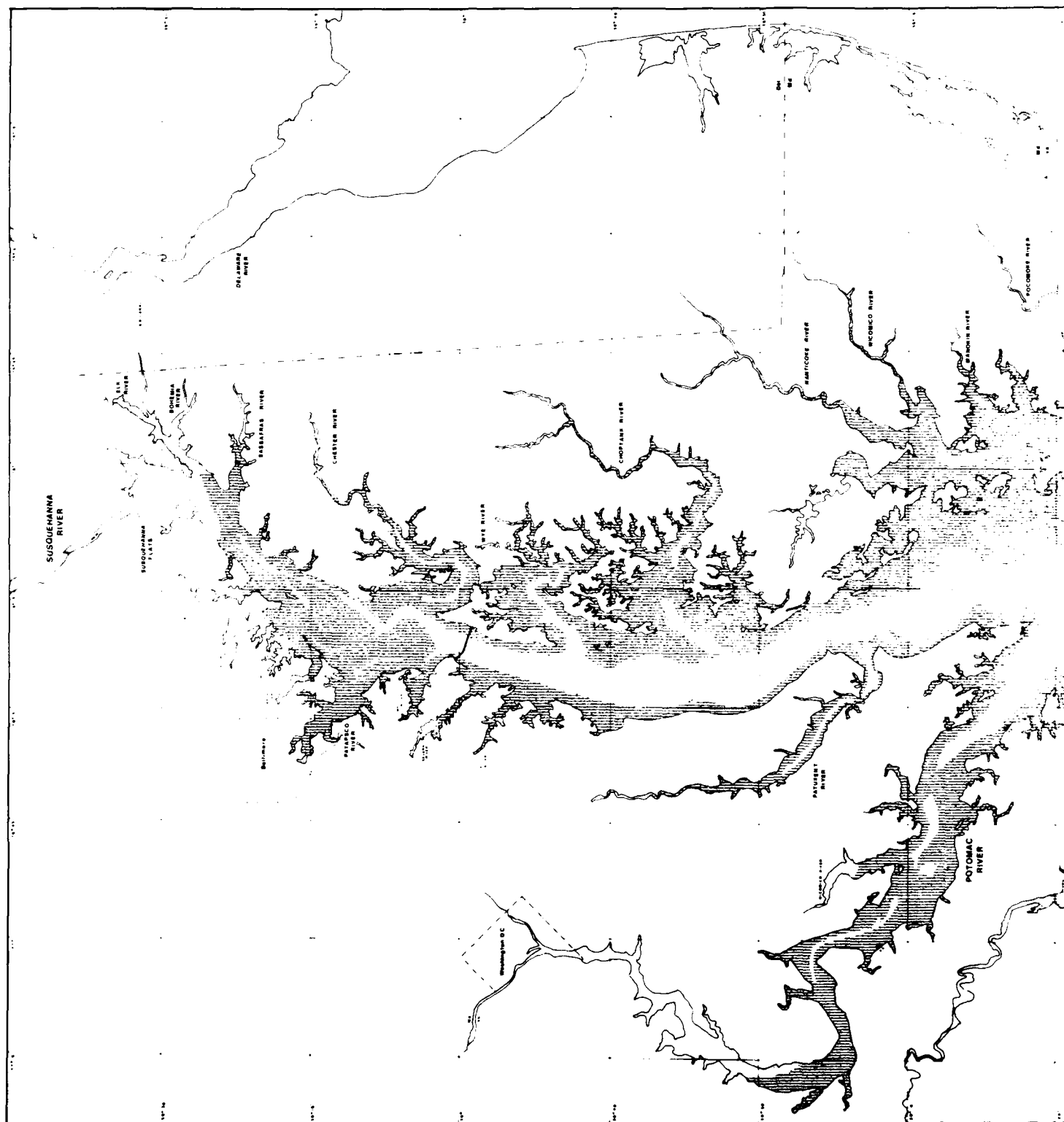
*Potamogeton pectinatus* - SAGO PONDWEED  
*Potamogeton perfoliatus* - REDHEAD GRASS

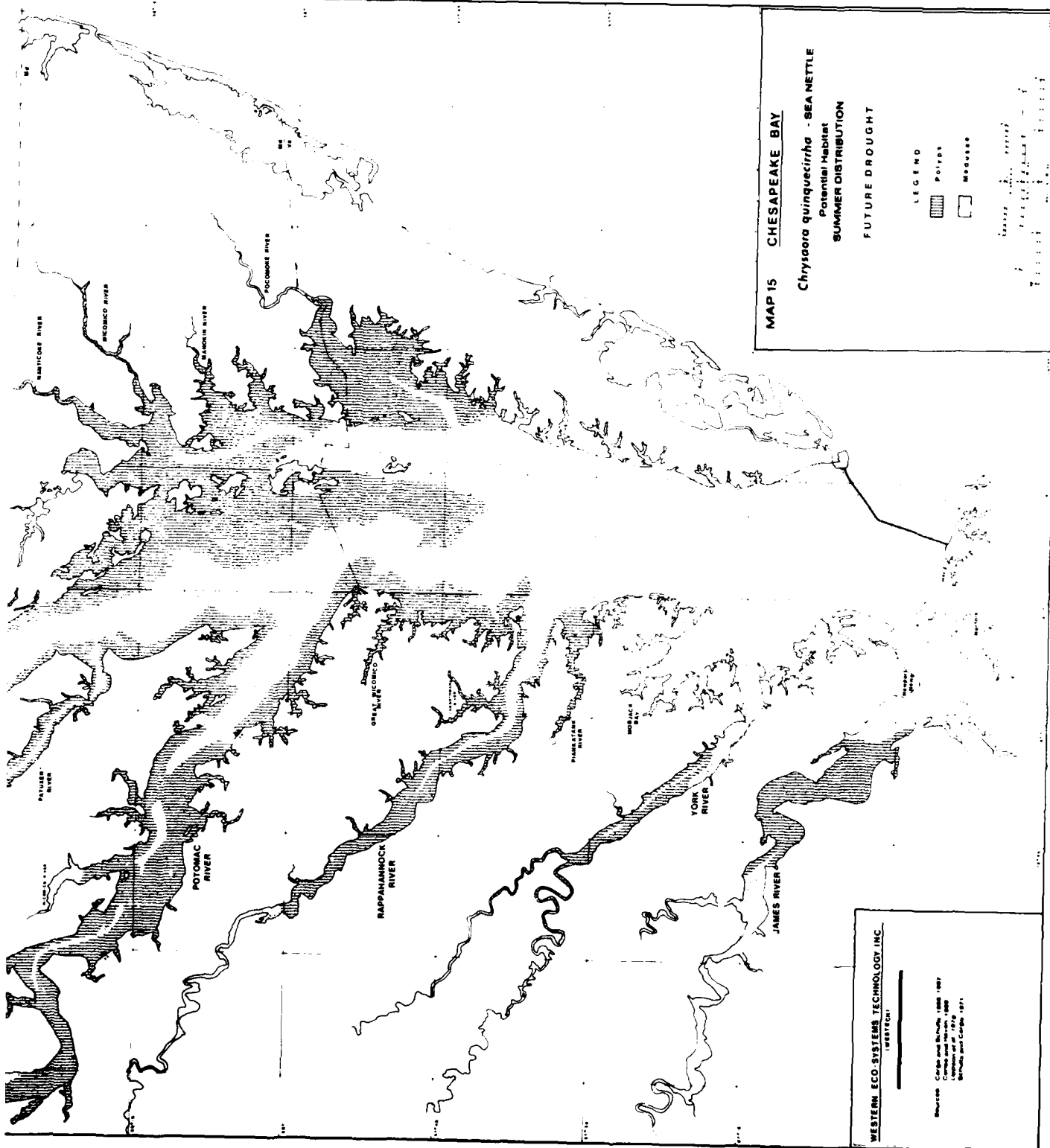
Potential Habitat  
 FUTURE DROUGHT

LEGEND  
 [Shaded Box] *Potamogeton* spp. HA  
 [Unshaded Box] FUTURE DROUGHT

**WESTERN ECO SYSTEMS TECHNOLOGY, INC.**  
 (WESTECH)

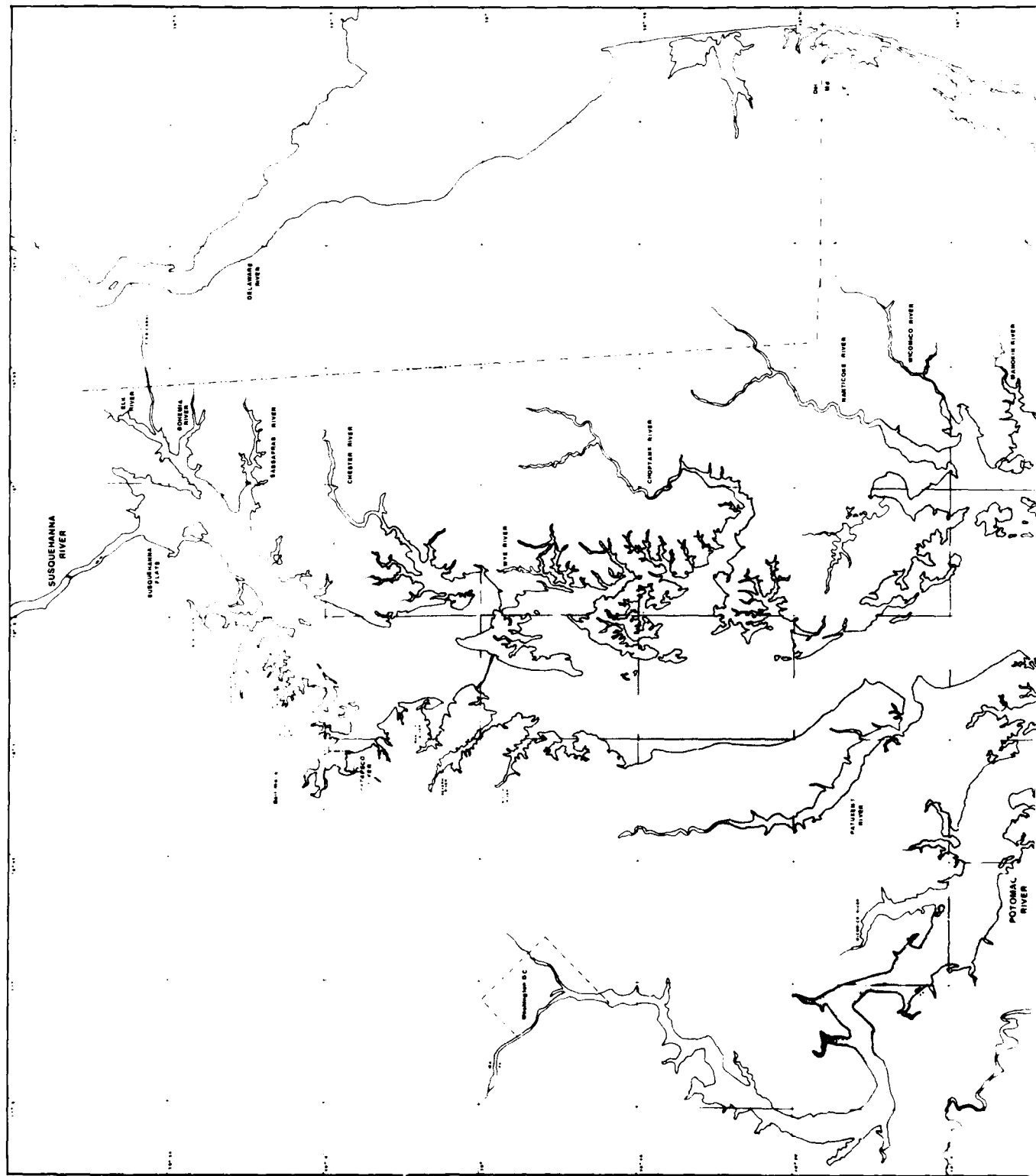
Source: Audubon and Macomber (1976)  
 Audubon, John  
 West, Robert and Gordon (1976)  
 West, Robert and Gordon (1976)













AD-A125 154

CHESAPEAKE BAY LOW FRESHWATER INFLOW STUDY PHASE II

BIOTA ASSESSMENT MAP..(U) WESTERN ECO-SYSTEMS

TECHNOLOGY INC BOTHELL WA G B MACKIERNAN ET AL. MAY 82

DACW31-79-C-0058

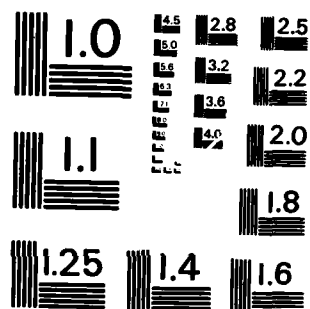
F/G 8/8

NL

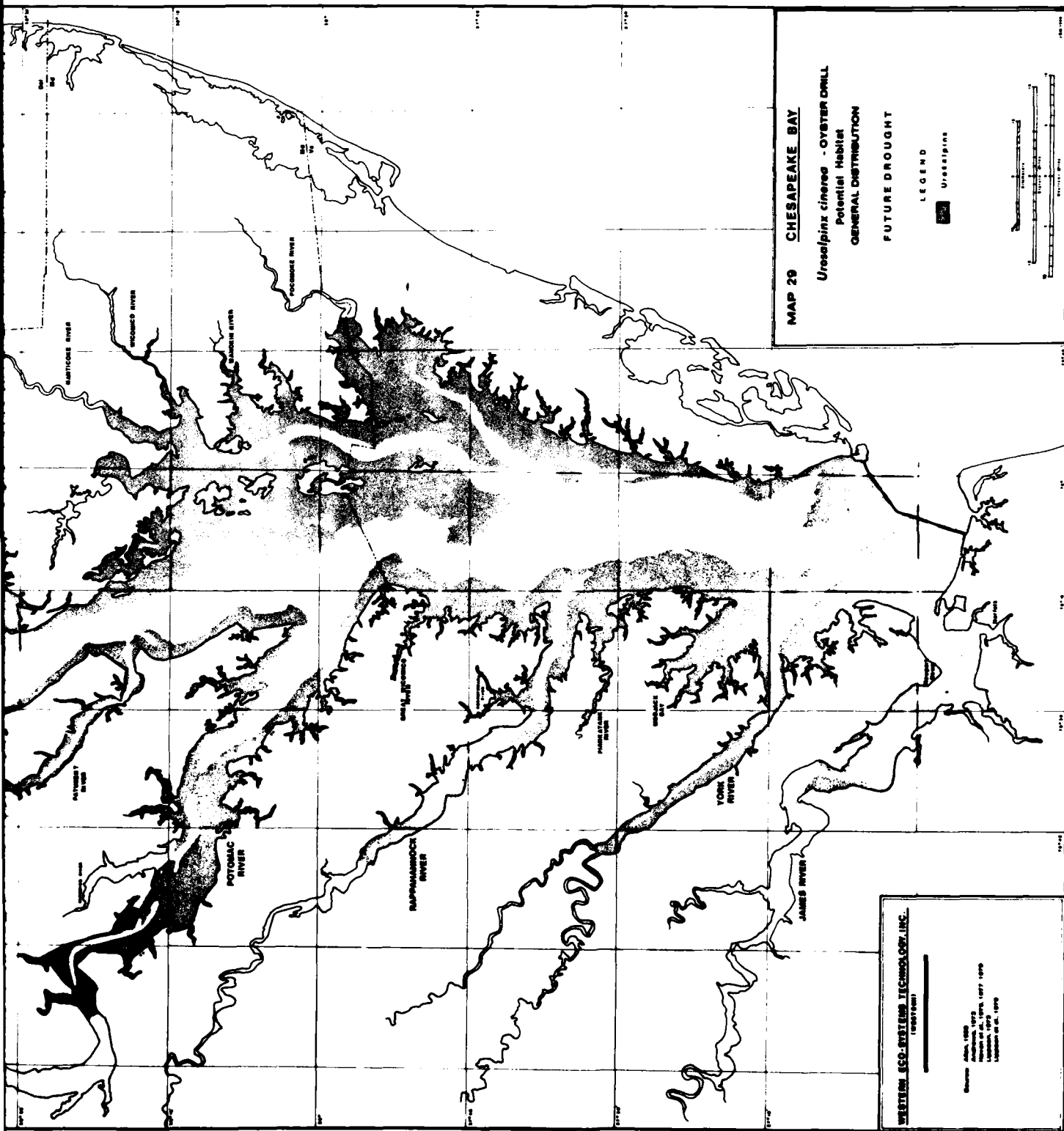
UNCLASSIFIED

2/2

													<div>END DATA FILMED 383 DTIC</div>



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A



**MAP 29 CHESAPEAKE BAY**

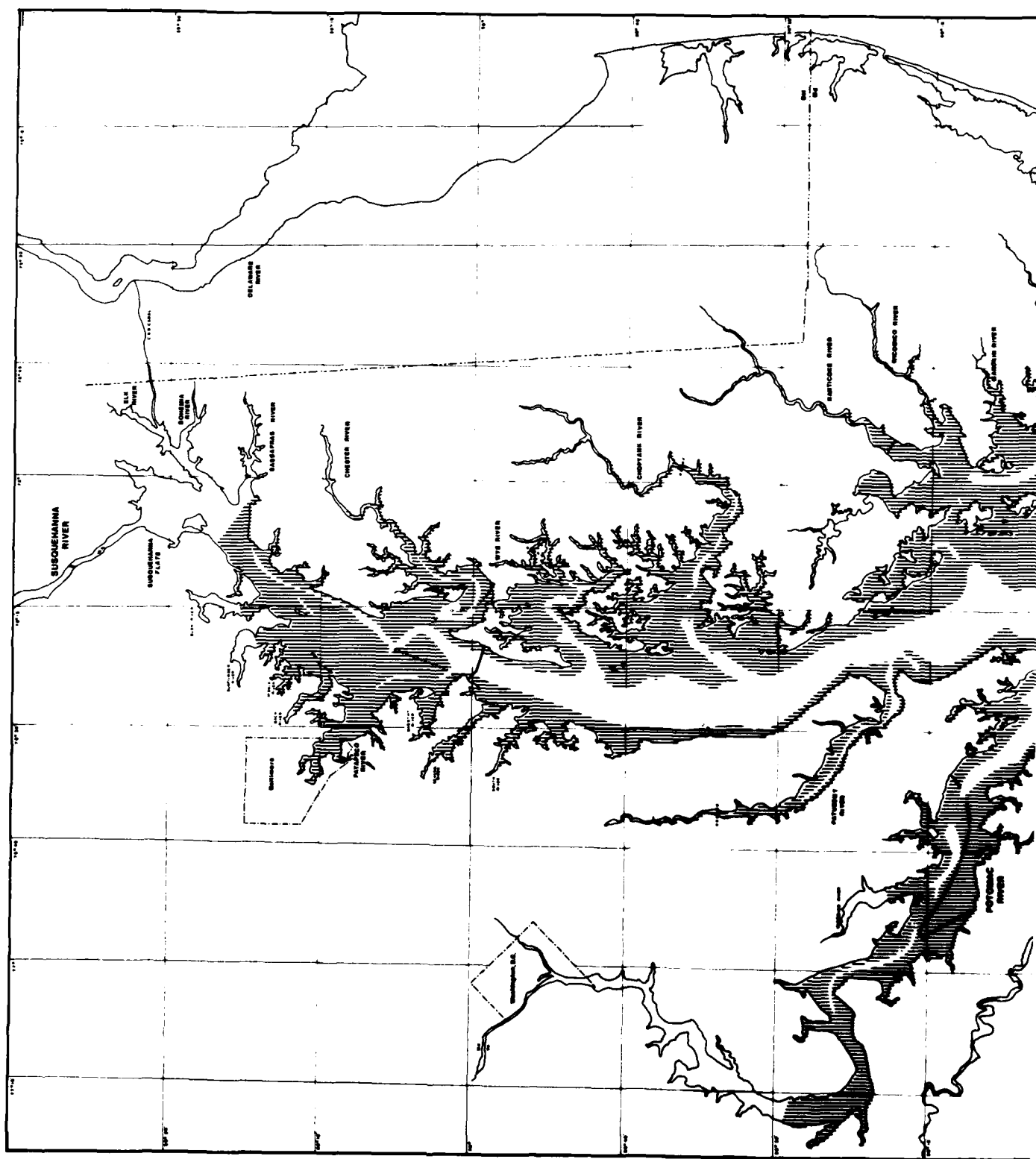
*Uresalpinx cinerea* - OYSTER DRILL  
 Potential Habitat  
 GENERAL DISTRIBUTION  
 FUTURE DROUGHT

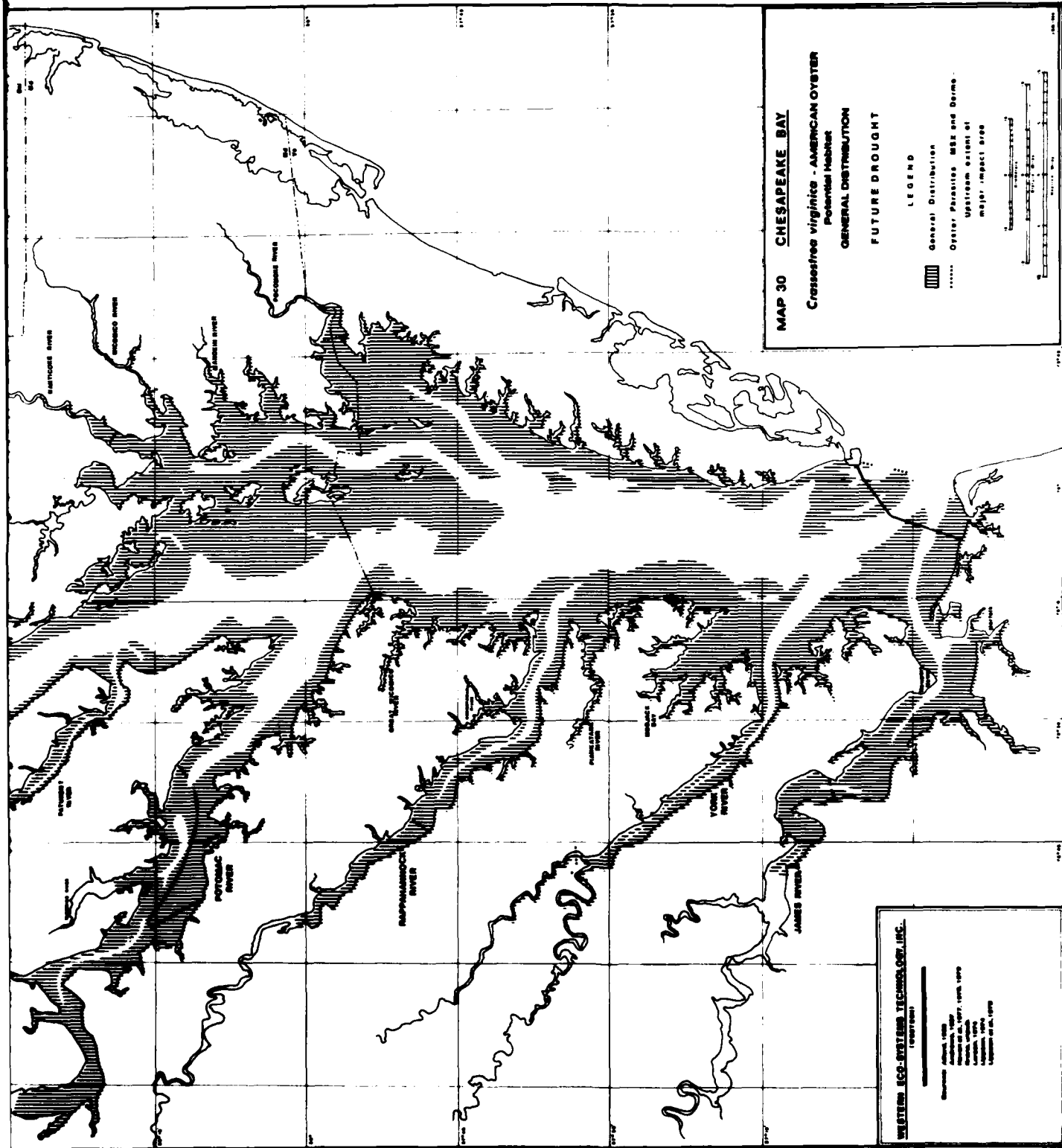
**LEGEND**

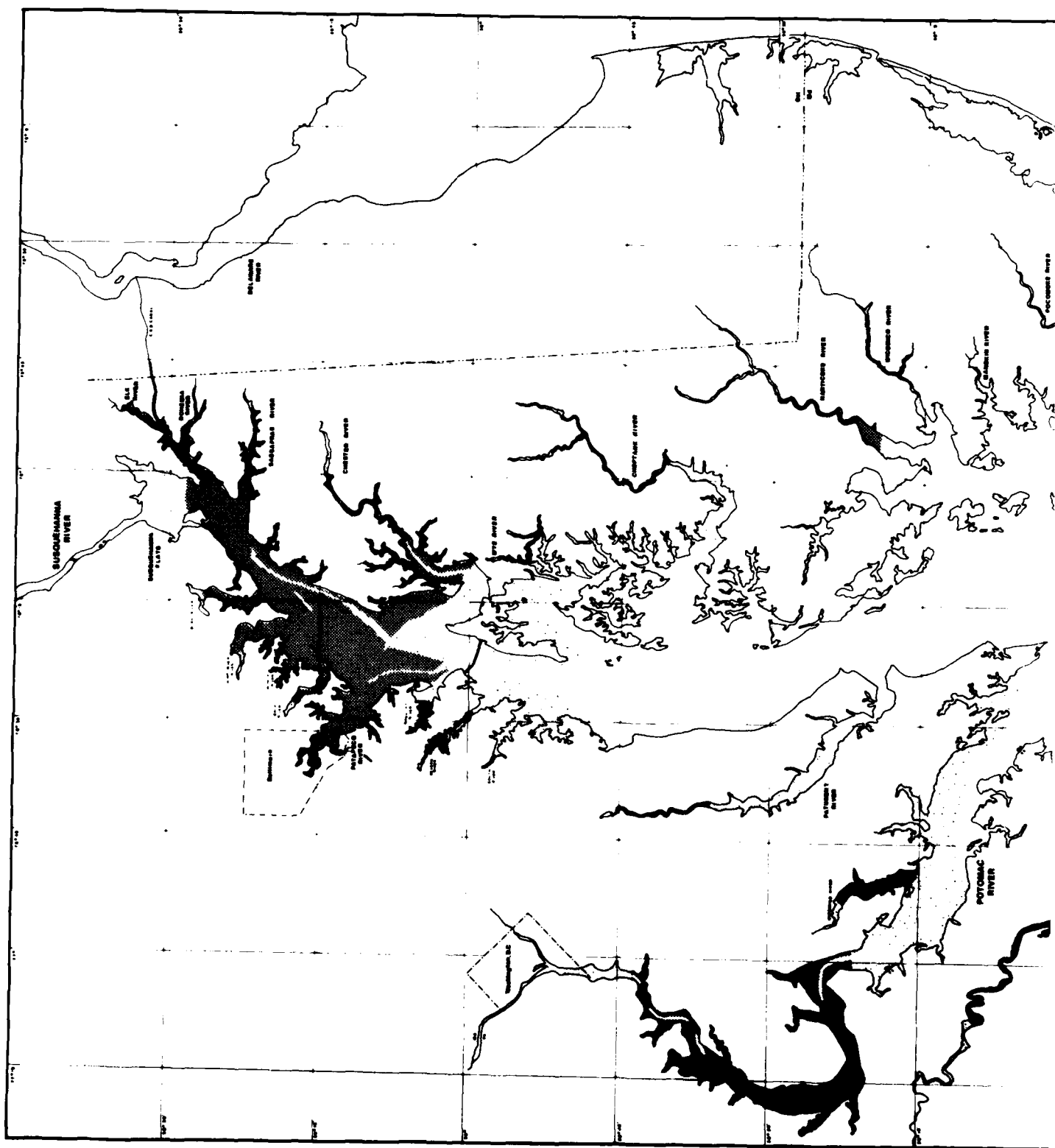
*Uresalpinx*

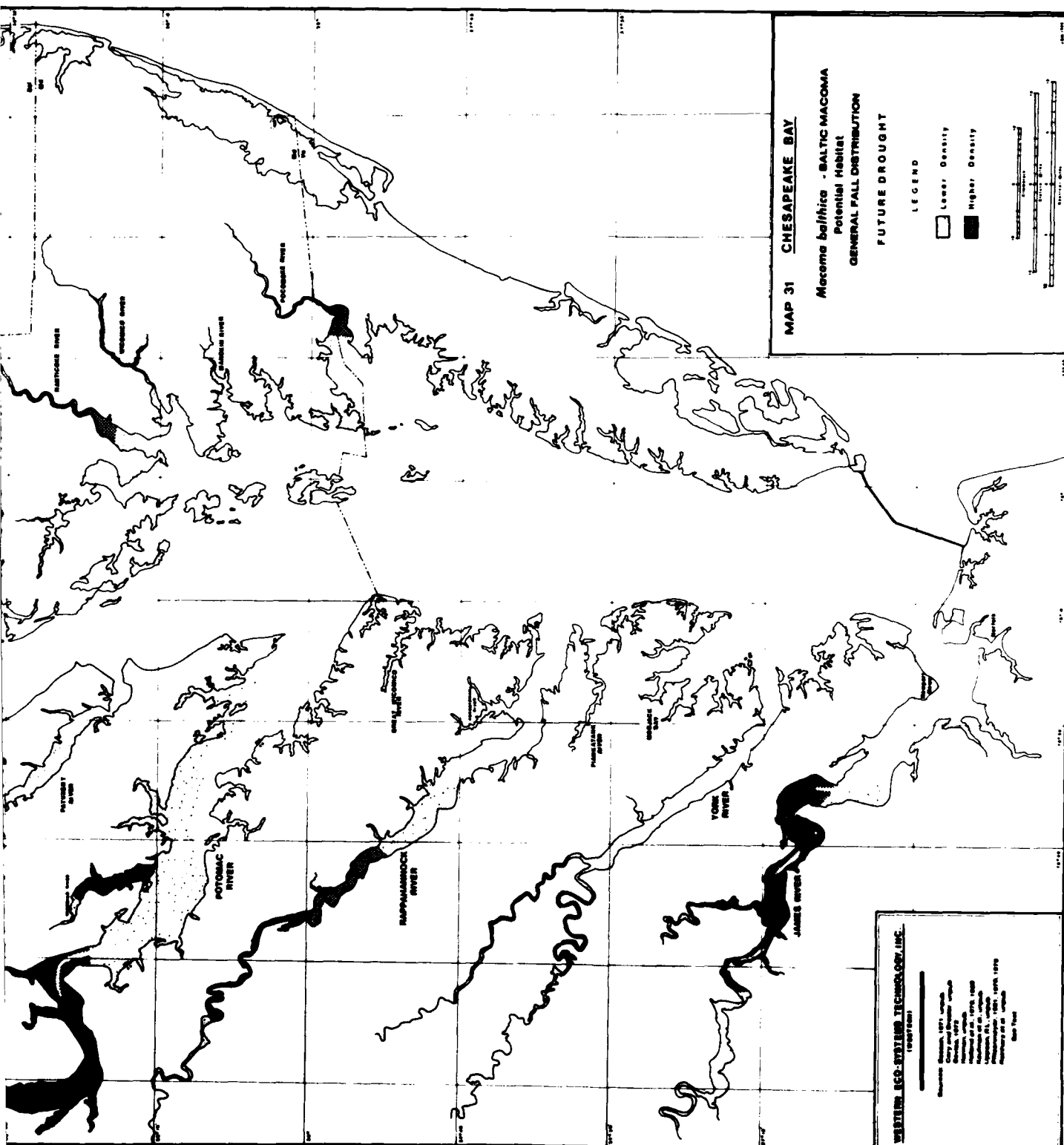
**WESTERN GEO-TECHNICAL TECHNOLOGY, INC.**  
 (1987-1988)

Revised: 1988  
 Prepared: 1987  
 Published: 1987  
 Copyright © 1987





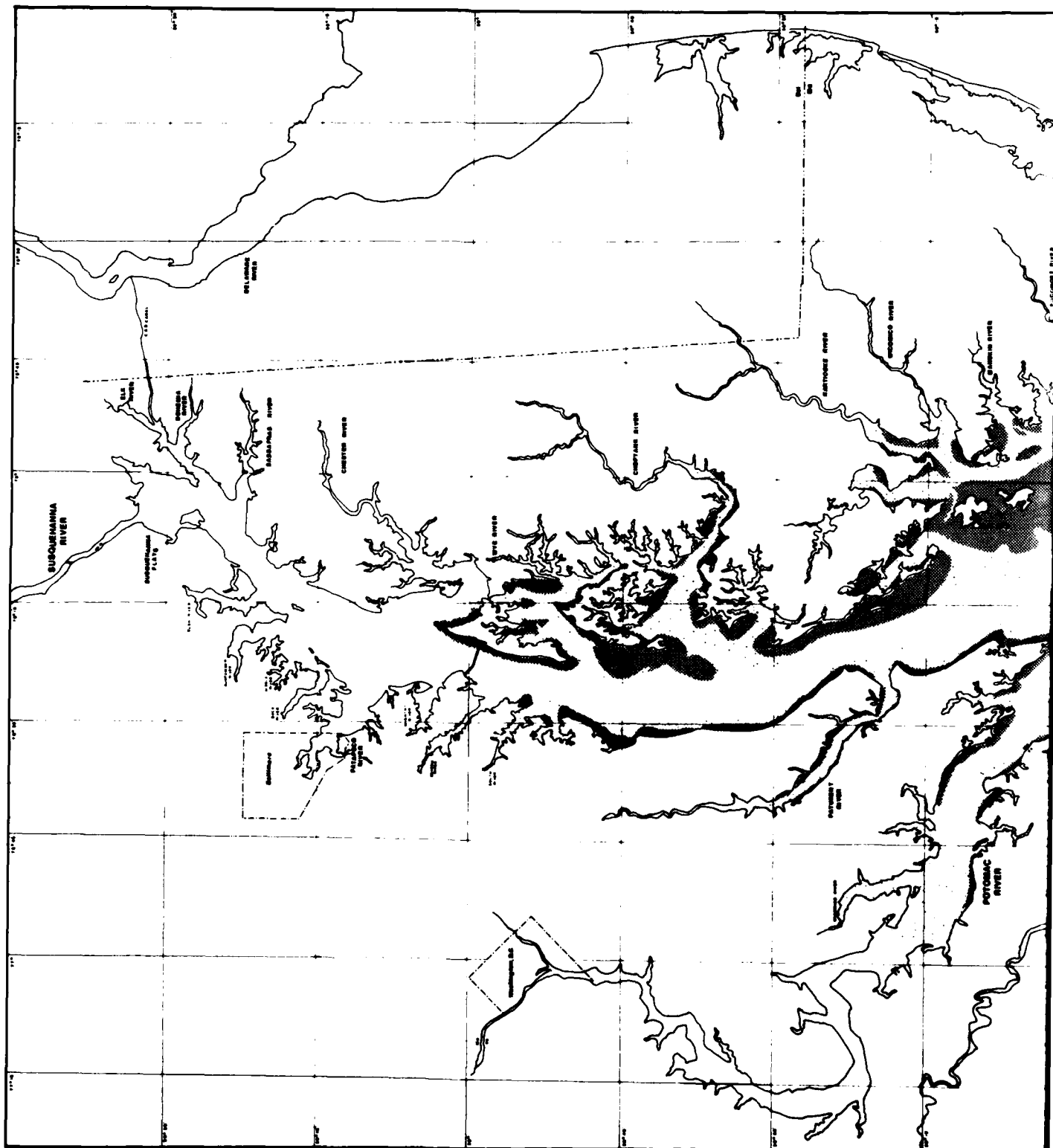




**WESTERN GEO-TECHNICAL TECHNOLOGY, INC.**  
(1987-1988)

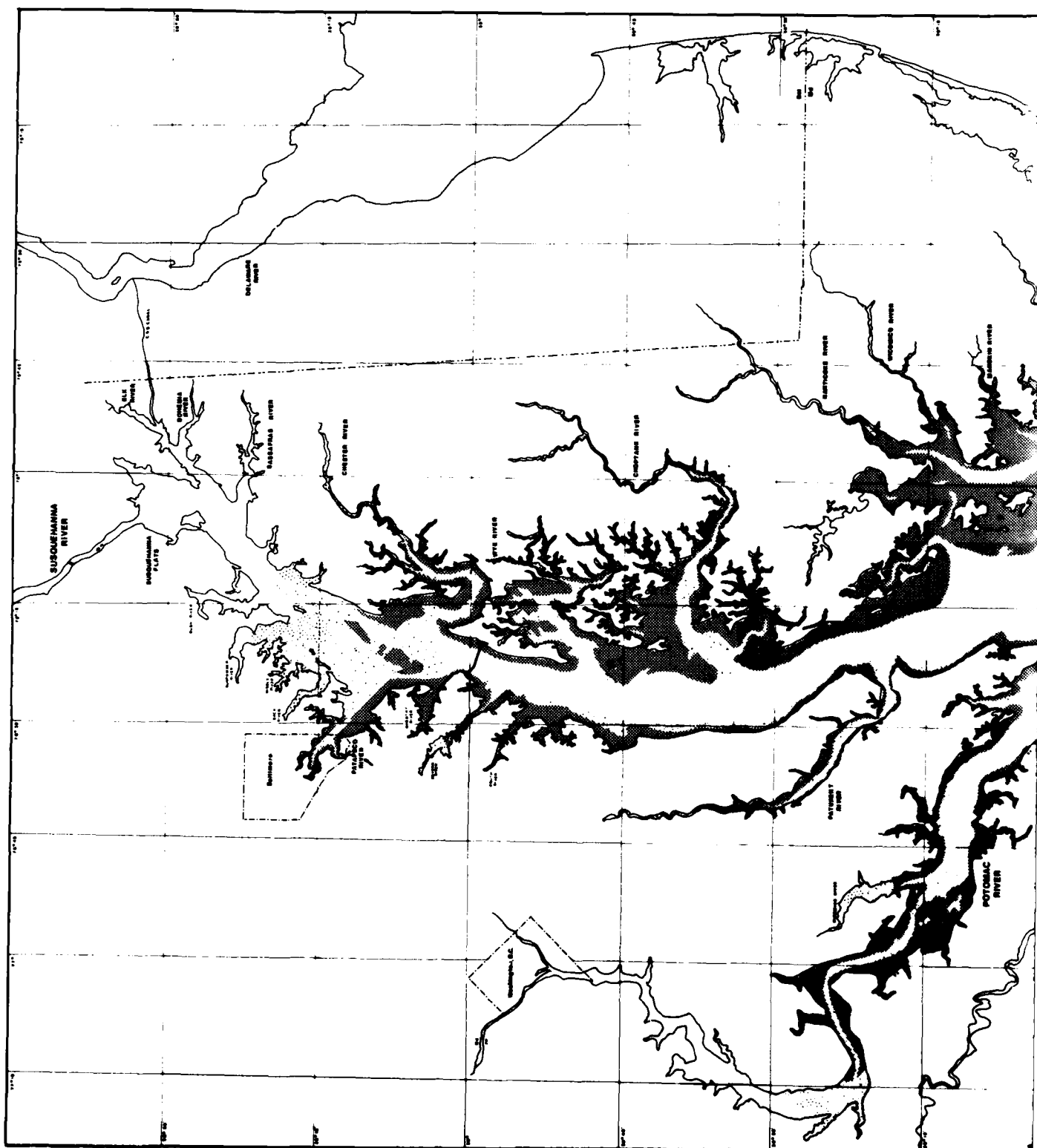
Project: Macoma balthica - Baltic Macoma  
Potential Habitat  
General Fall Distribution  
Future Drought  
Map 31

Map 31

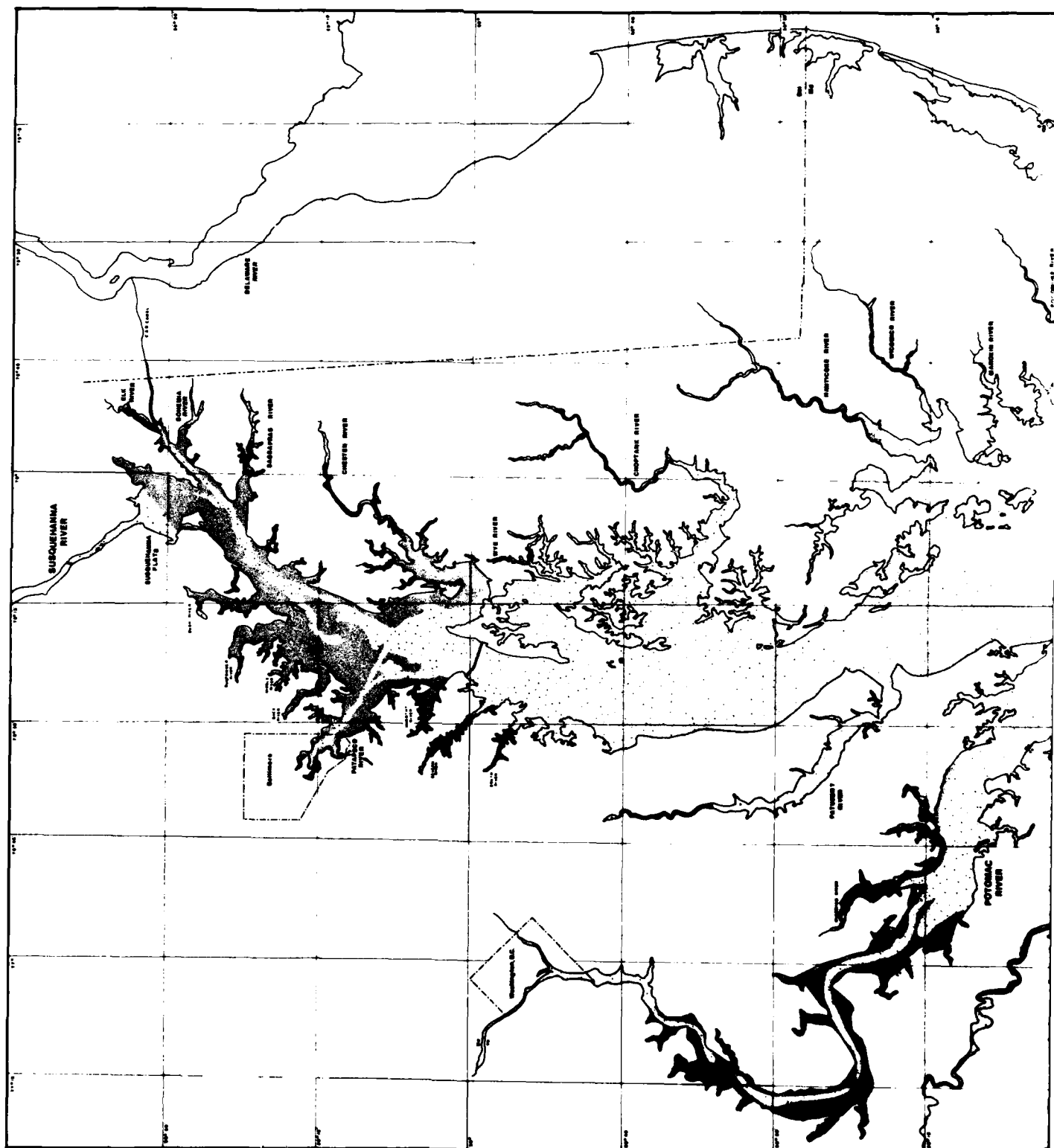


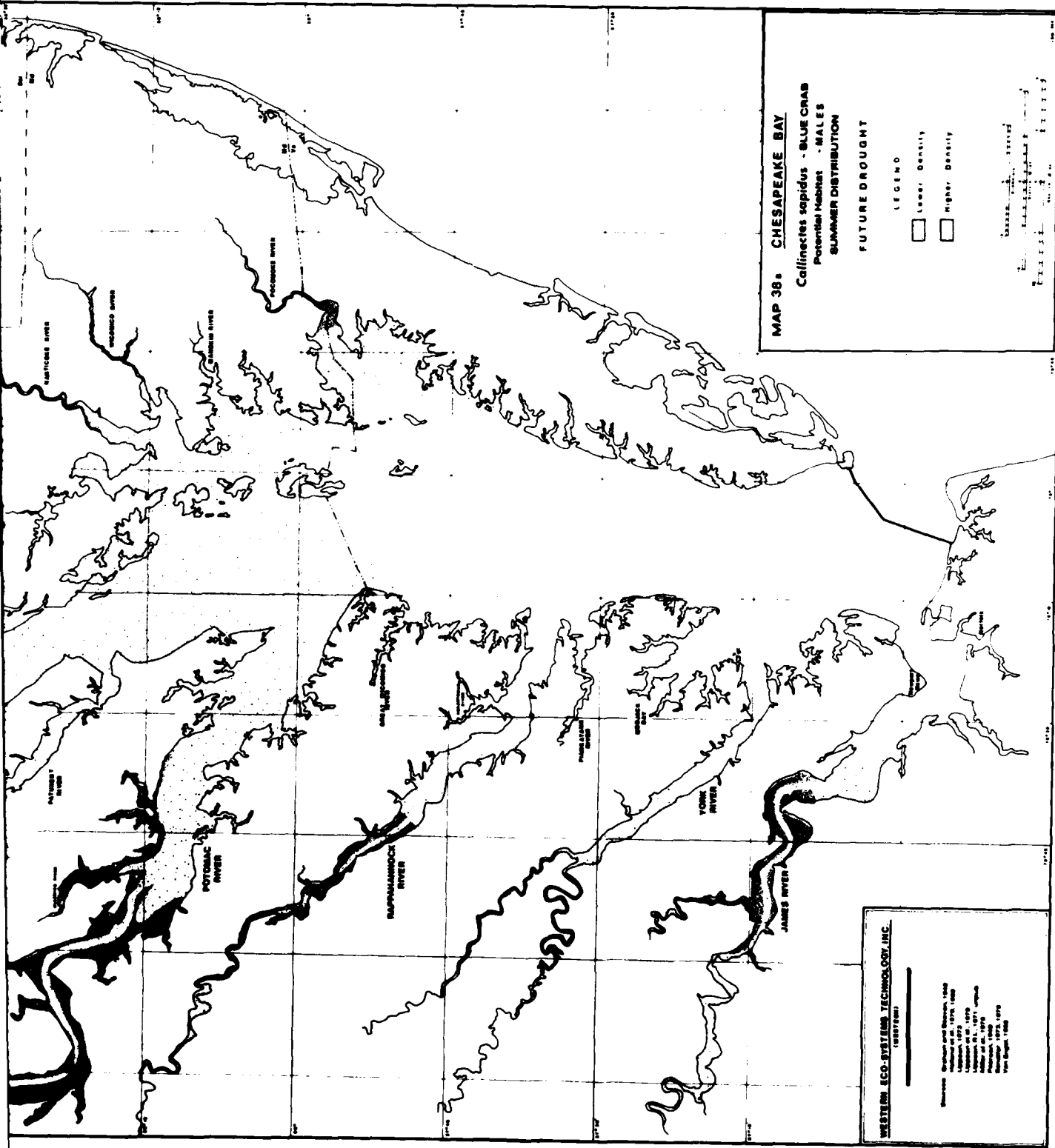


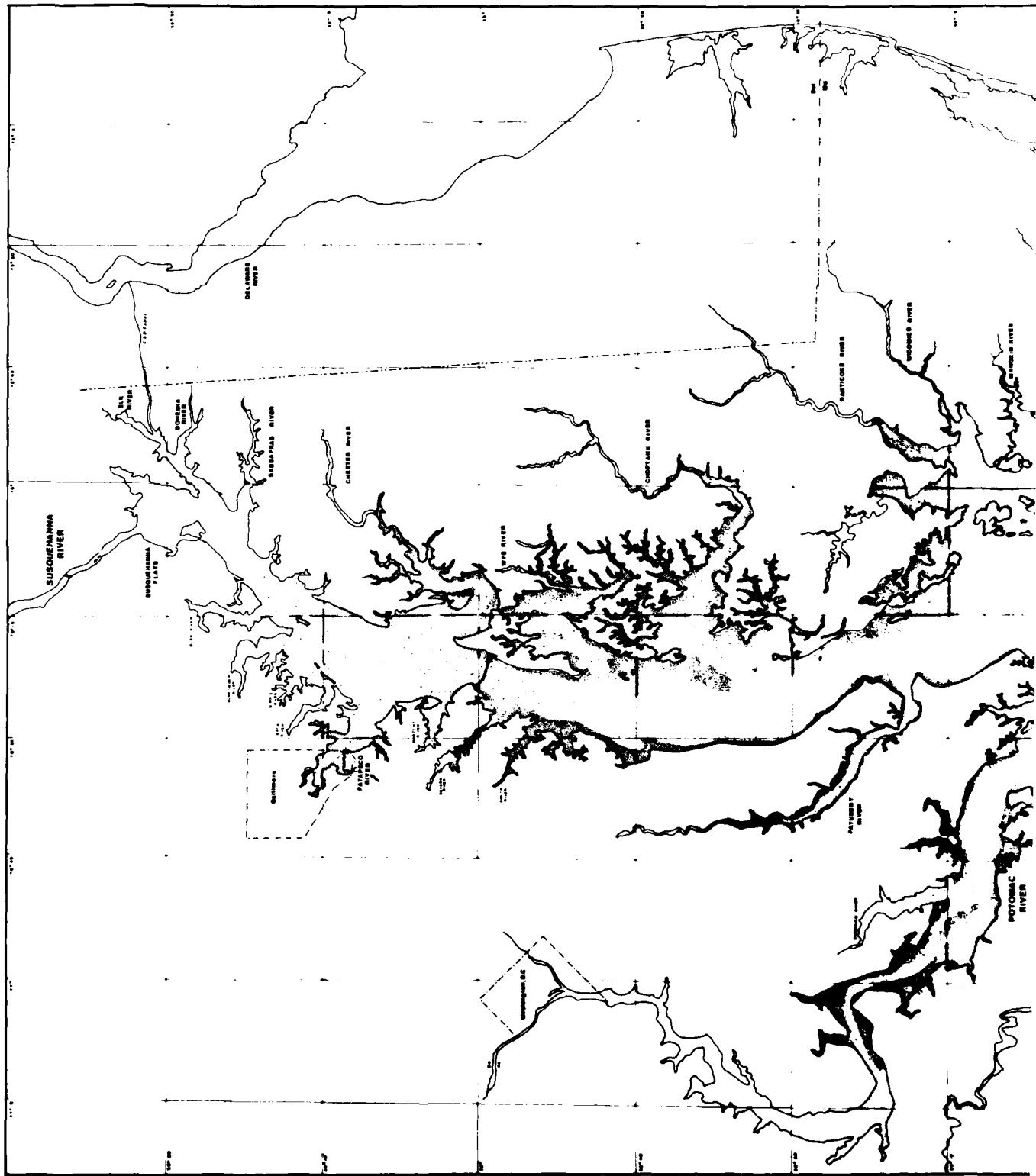




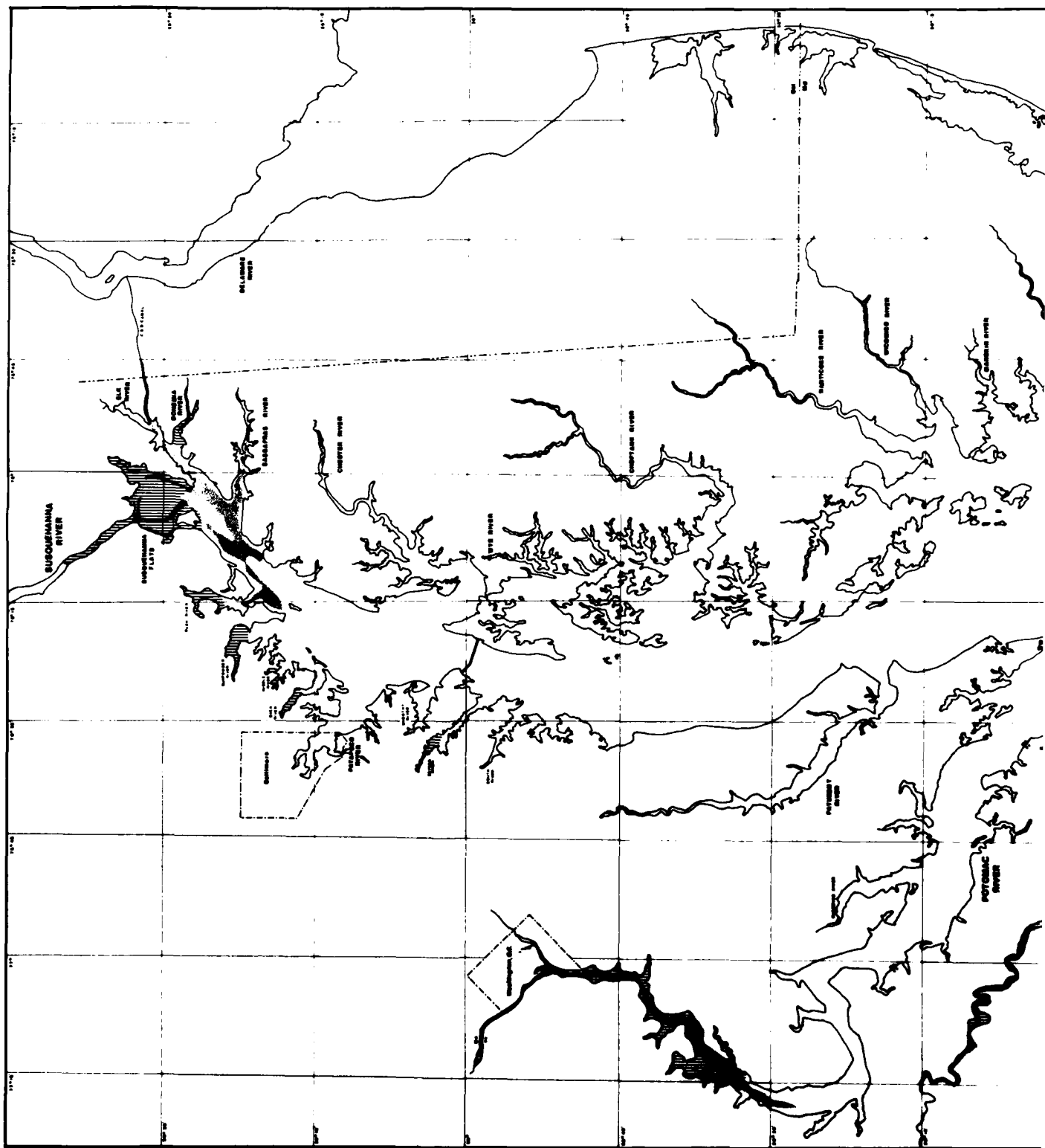




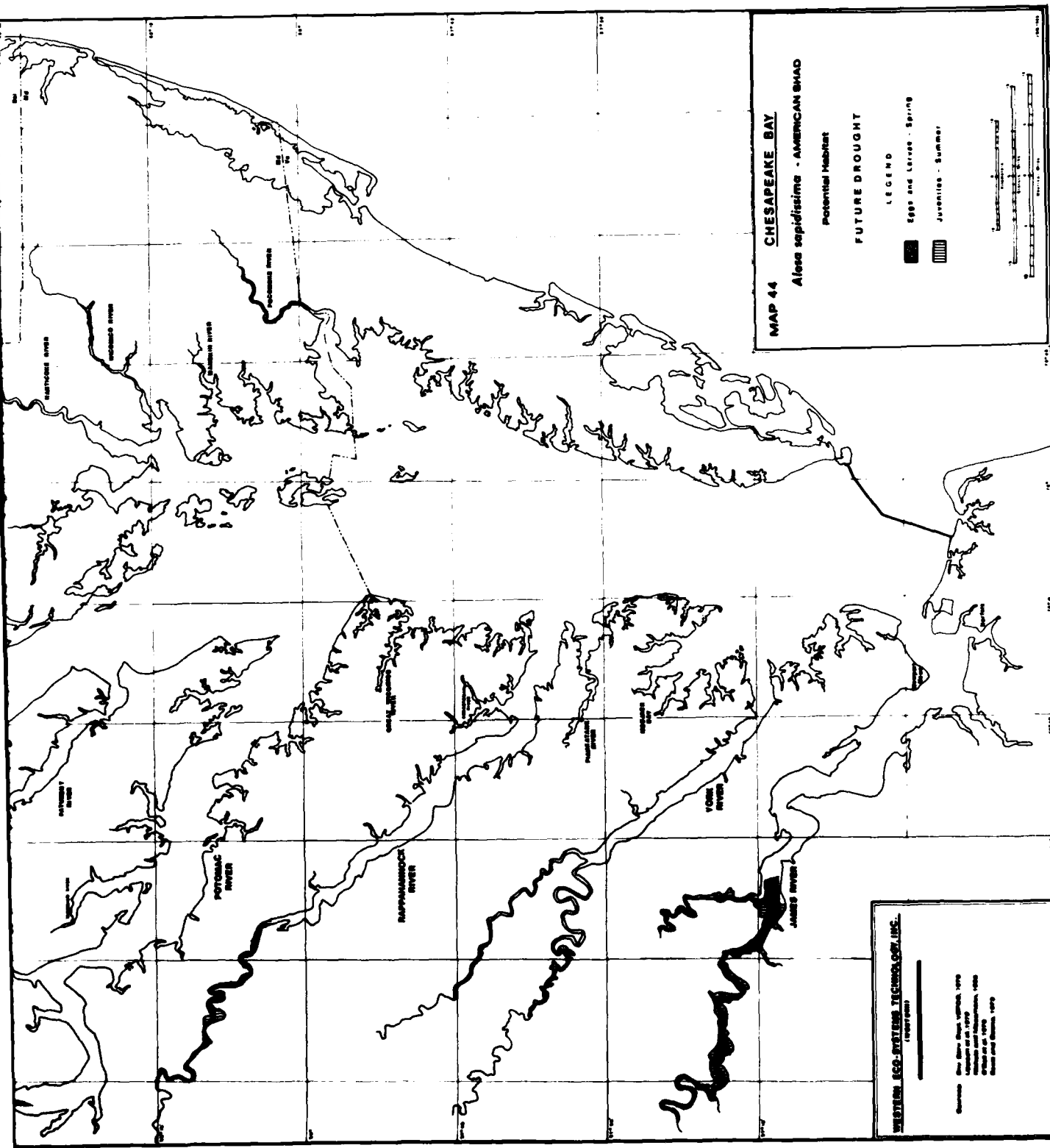






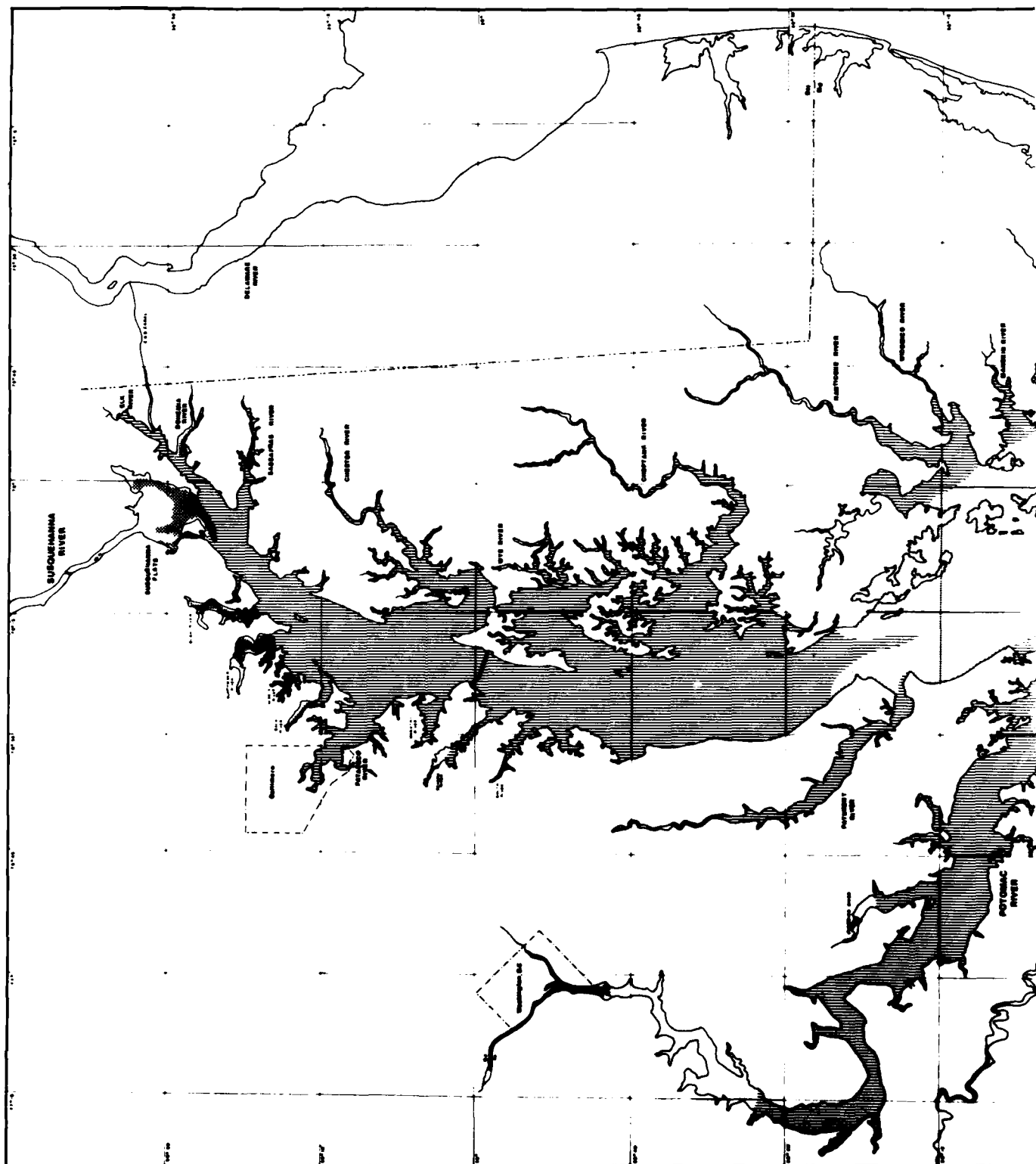


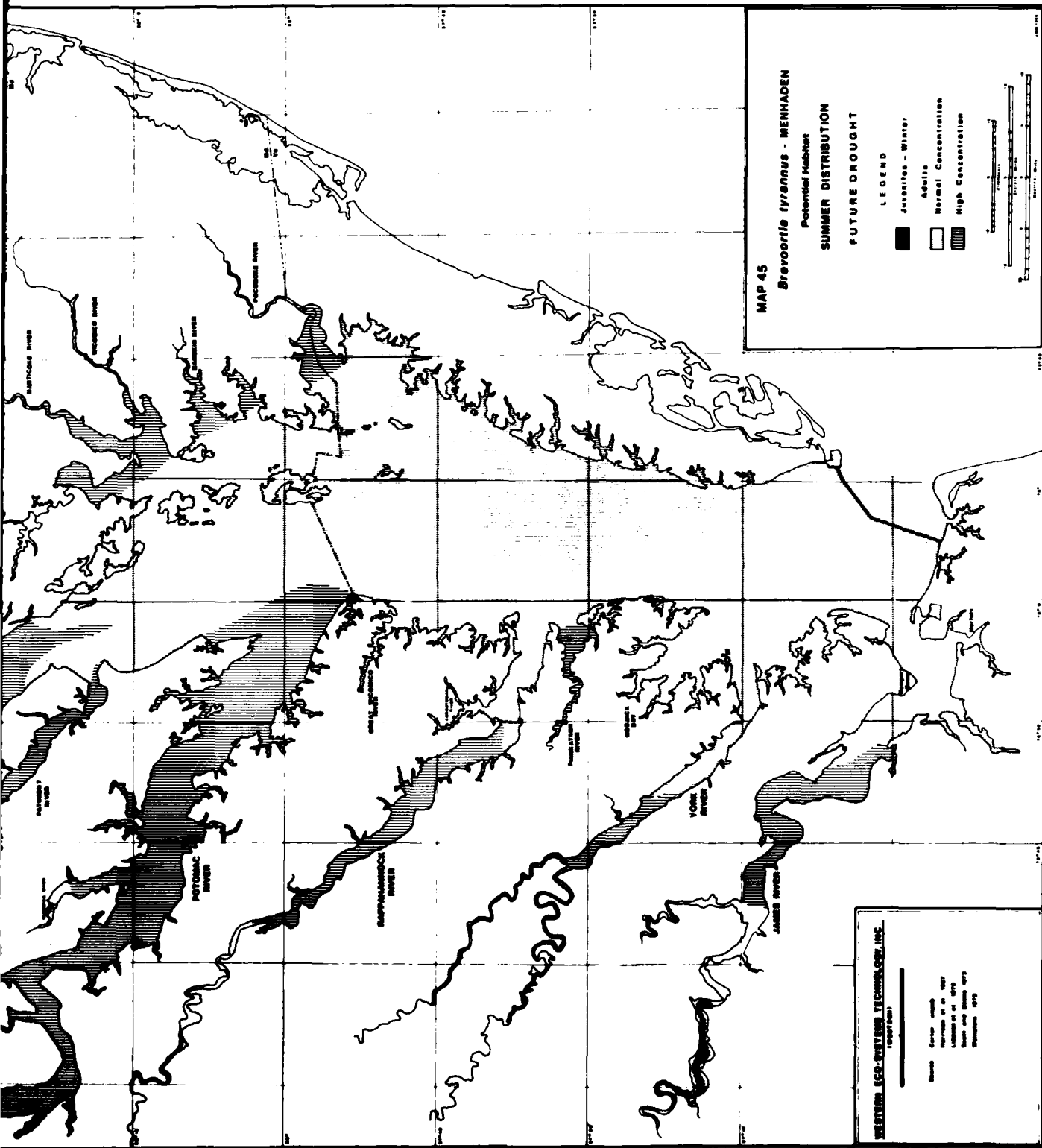


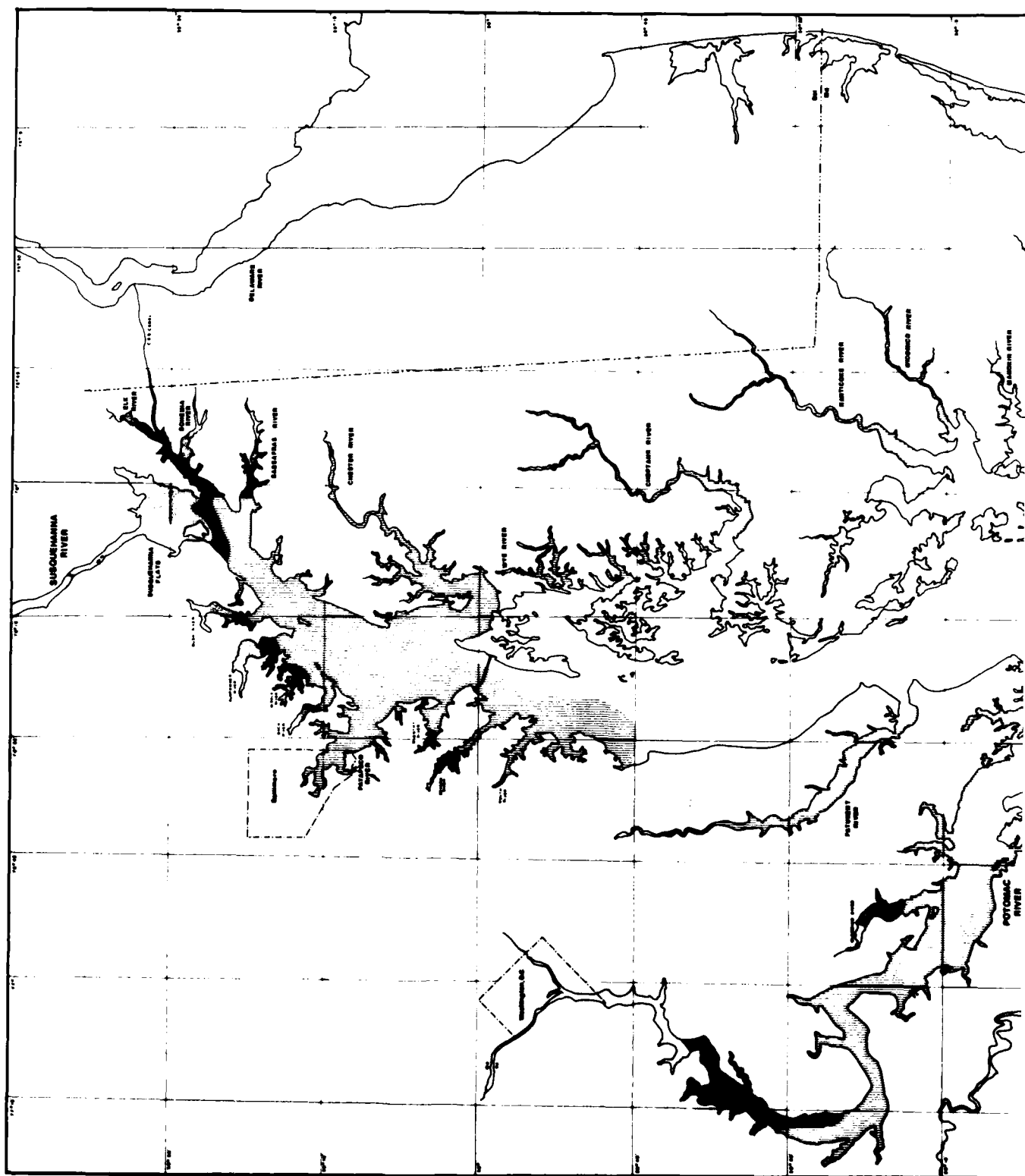


**WESTERN ECO-SYSTEM TECHNOLOGY, INC.**  
 (1980-1981)

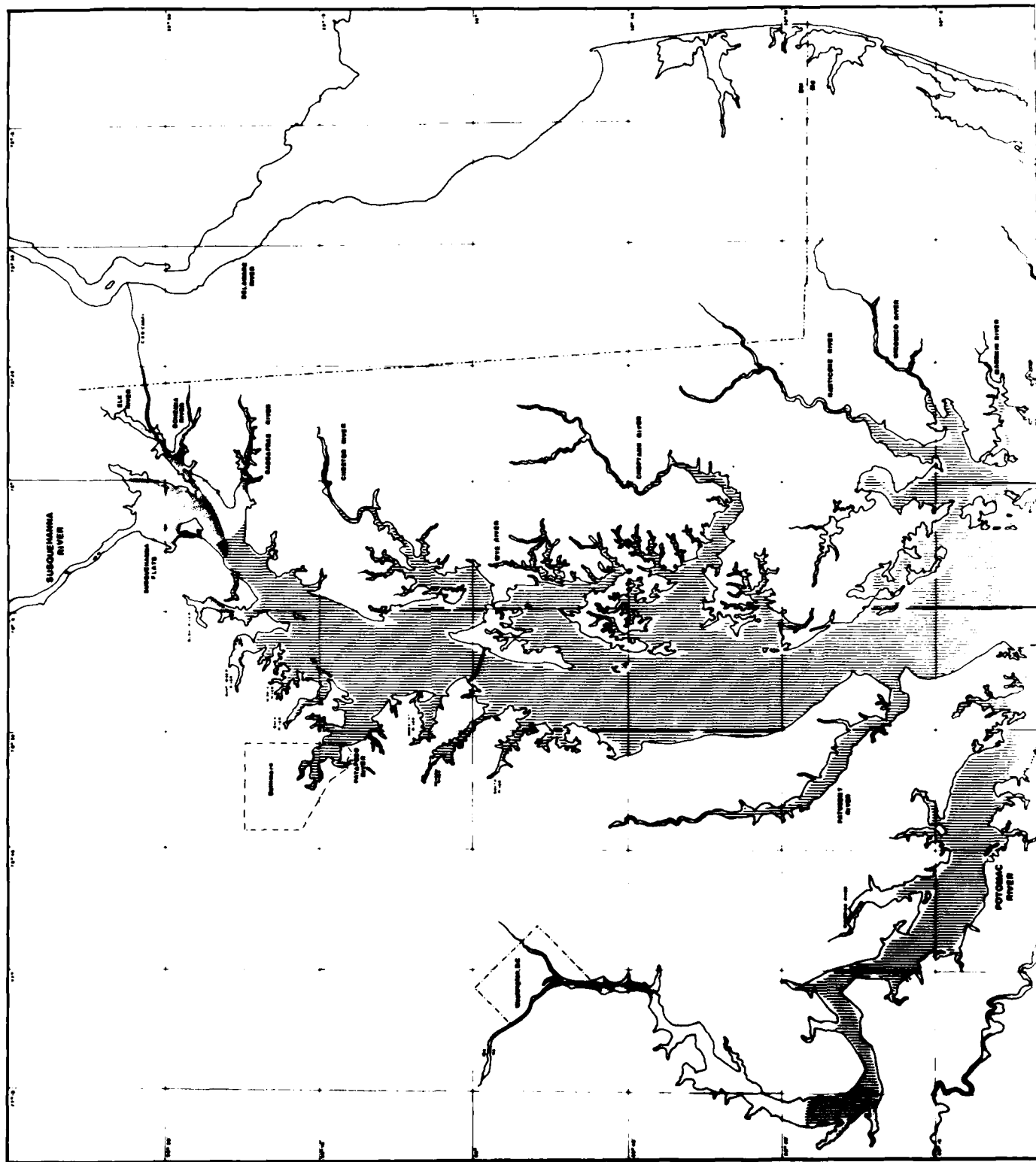
Prepared by: John R. Smith, 1980  
 Revised by: J. R. Smith, 1981  
 Revised by: J. R. Smith, 1982  
 Revised by: J. R. Smith, 1983

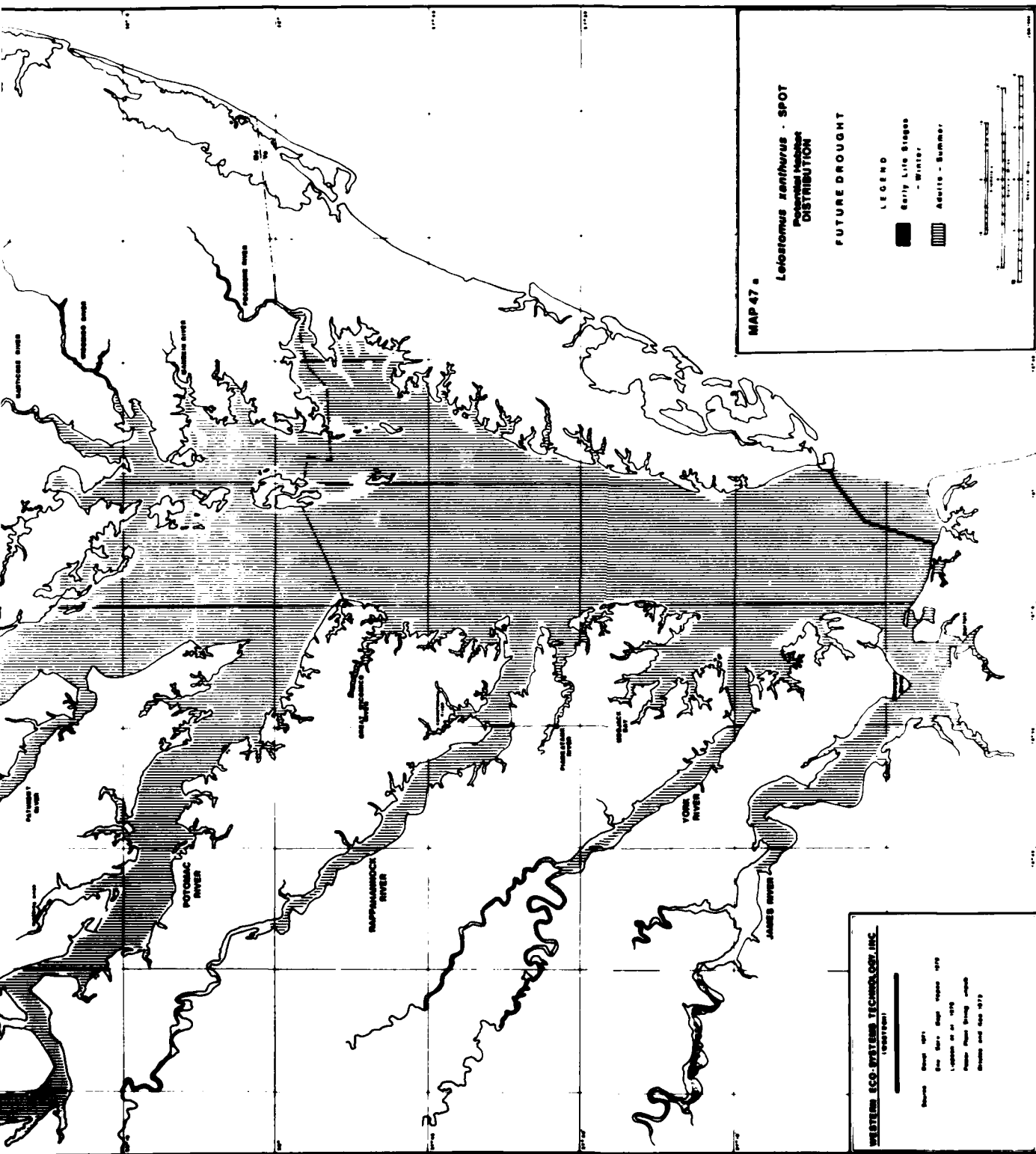


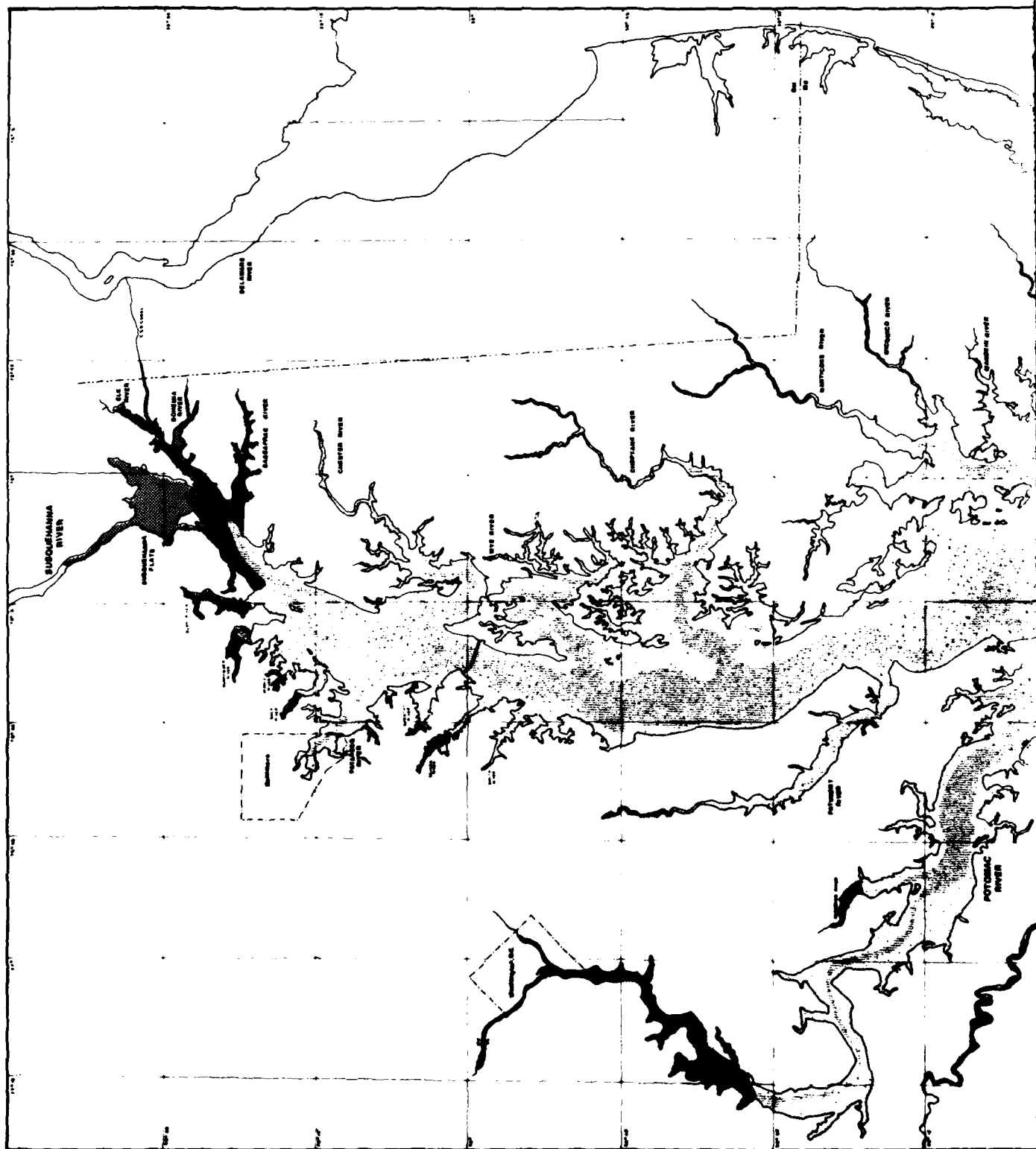




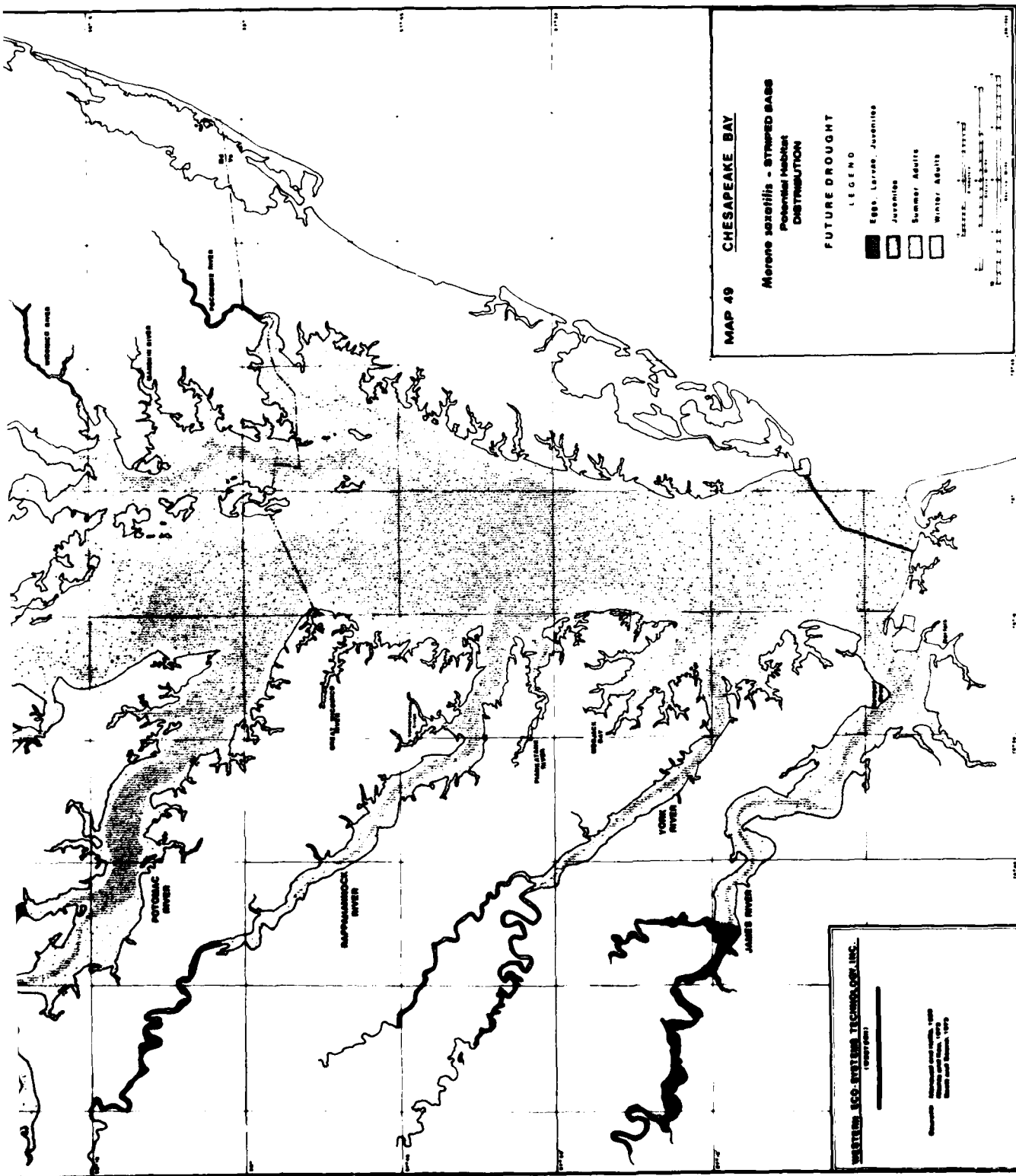


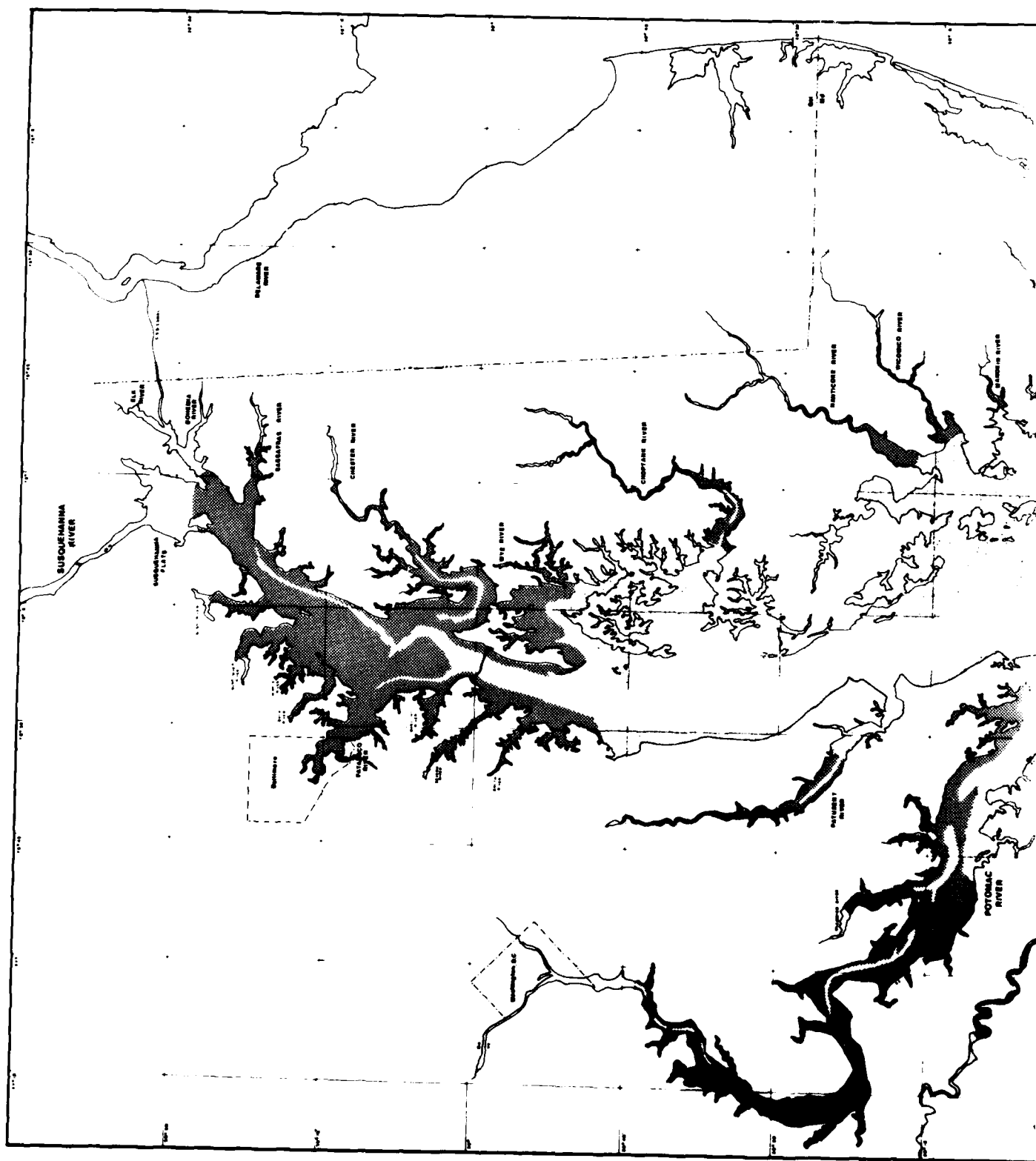














END

DATE  
FILMED

3-83

DTI